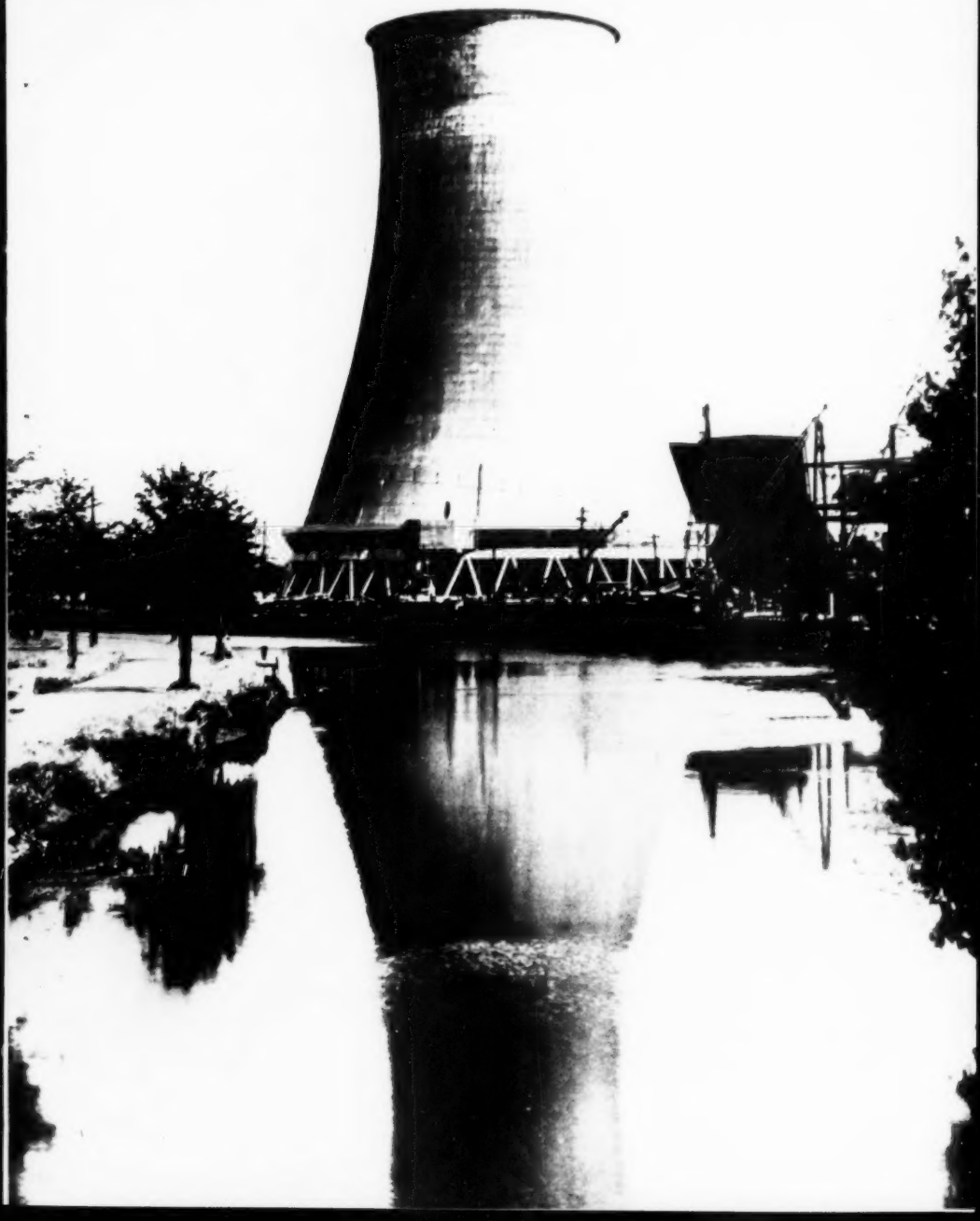
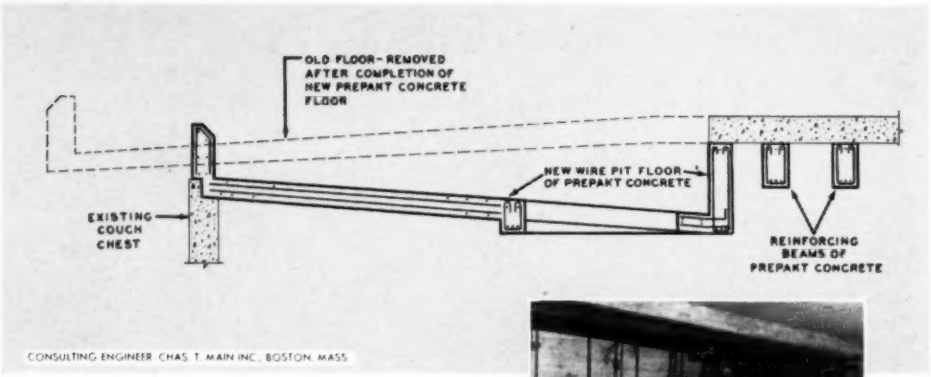
ACI News Letter

Vol. 24, No. 10 JOURNAL of the AMERICAN CONCRETE INSTITUTE June 1953



PREPAKT KEEPS PRODUCTION ROLLING DURING MODERNIZATION of PAPER MILL


OLD FLOOR—REMOVED AFTER COMPLETION OF NEW PREPAKT CONCRETE FLOOR
NEW WIRE PIT FLOOR OF PREPAKT CONCRETE
EXISTING COUCH CHEST
REINFORCING BEAMS OF PREPAKT CONCRETE
CONSULTING ENGINEER CHAS. T. MAIN INC., BOSTON, MASS.

Enlarged wire pit for new paper making machine built by Prepakt method. Old floor was later removed.

Here's a case where a modern industrial plant completed most of its improvement program without interrupting production and losing profits.

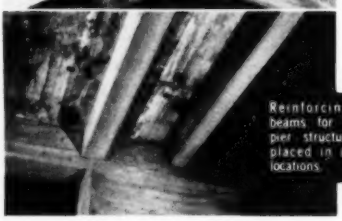
The Mosinee Paper Mills Co. of Mosinee, Wisc., accomplished this by using Prepakt methods for placing concrete to support a new Fourdrinier paper-making machine and calender stack. The unique advantages of the Prepakt technique—preplacing aggregate in the forms and then pumping the voids full with Intrusion mortar—were clearly demonstrated in this case.

All construction for enlarging the wire pit and reinforcing the floors was done from the basement with existing equipment in place and without disturbing operations. Prepakt overcame difficult problems of placing concrete in "hard-to-get-at" overhead forms and produced high-strength bond to existing concrete. And the cleanliness of the Prepakt method avoided spoilage of any paper in process.

All concrete work was executed prior to the shutdown necessary for changing over to the new machine, reducing lost production to an absolute minimum.

Wire pit during construction showing reinforcing steel and preplaced aggregate

Completed wire pit before removal of old floor (above).



Reinforcing cross beams for calender pier structure were placed in difficult locations.

This is typical of the important savings possible with Prepakt methods and materials. Full information on the advantages of Prepakt may be obtained from the Main Office, Cleveland, O.

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ACI

News Letter Contents

June 1953

On the Cover—Hyperbolic reinforced thin-shell concrete cooling tower at a power plant installation, Northampton, England (for further details see News Letter, p. 28).

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WANTED—TIMBER

Yes—human timber to build a backlog of qualified individuals for future service on ACI's technical committees. The Technical Activities Committee views with concern the fact that only 282 individuals make up ACI's 31 technical committees. Thus, with less than 5 percent of ACI's 6100 members active in committee work, TAC is convinced that much member talent remains undiscovered and unused in this most important ACI activity from which come the reports and Standards which are the authoritative voice of the Institute.

What's the remedy? The silent 95 percent must provide it by making known their interest in and qualifications for committee assignments so that TAC may, from the information furnished, recommend new appointments to existing committees and select personnel for new committees which may be organized in the future.

It has been said that knowledge pent up within an individual is of little value—only when it is transmitted to others does it establish its true worth. Only you know your most engrossing interests and your technical fortes. Only you can apprise those responsible for committee affairs of your potential for participation in technical work of the Institute.

Look over the list of technical committees which follows and write ACI headquarters about your technical background and designate that committee on which you would most like to serve. (More detailed information on committee assignments may be found on pp. 19-28, *News Letter*, ACI JOURNAL, May 1952.) Secondary choices will also be of interest.

Since relatively small committees have proved most effective and the process of infusing new personnel into committees is necessarily slow, immediate appointment to the committee of your choice may, of course, not be possible. However, be assured that when vacancies occur or new committees are formed your qualifications will be given fullest consideration.

Continued on p. 4

If you have interest in studies not listed please give some details about them.

ACI technical committees

Committee 115, Research
Committee 207, Properties of Mass Concrete
Committee 208, Bond Stress
Committee 209, Volume Changes and Plastic Flow in Concrete
Committee 210, Resistance to Erosion in Hydraulic Structures
Committee 212, Admixtures
Committee 213, Properties of Lightweight Aggregates and Lightweight Aggregate Concrete
Committee 214, Evaluation of Results of Compression Tests of Field Concrete
Committee 215, Fatigue of Concrete
Committee 312, Plain and Reinforced Concrete Arches
Committee 314, Rigid Frame Bridges
Committee 315, Detailing Reinforced Concrete Structures
Committee 318, Standard Building Code
Committee 321, Design of Reinforced Concrete Slabs—Joint ACI-ASCE
Committee 323, Prestressed Reinforced Concrete—Joint ACI-ASCE
Committee 324, Precast Reinforced Concrete Structures
Committee 325, Structural Design of Concrete Pavements for Highways and Airports
Committee 326, Shear and Diagonal Tension—Joint ACI-ASCE
Committee 327, Ultimate Load Design—Joint ACI-ASCE
Committee 505, Design and Construction of Reinforced Concrete Chimneys
Committee 604, Winter Concreting Methods
Committee 609, Compaction of Concrete by Mechanical Means
Committee 611, Inspection of Concrete
Committee 612, Recommended Practice for Curing Concrete
Committee 613, Recommended Practice for Proportioning Concrete Mixes
Committee 616, Recommended Practice for the Application of Paint to Concrete Surfaces
Committee 617, Specifications and Recommended Practice for Concrete Pavements and Bases
Committee 620, Construction Joint Practice
Committee 621, Aggregate Selection, Preparation, and Handling
Committee 711, Precast Floor Systems for Houses
Committee 716, High Pressure Steam Curing

DON'T FORGET—

there will be no JOURNAL issues in July and August.

The next issue you receive will be September, 1953.

Recent appointments and reappointments to ACI technical committees

Included in this list of ACI technical committee members are new appointments. Members' names listed as being reappointed are those whose terms expired this year. This list does not include committee members whose terms expire next year.

Committee 115, Research

New appointments

George C. Ernst
University of Nebraska

D. R. MacPherson
Johns-Manville Corp.

K. P. Milbradt
Illinois Institute of Technology

Robert P. Witt
Oklahoma A & M College

Hubert Woods (Executive Group)
Portland Cement Assn.

Reappointments

Raymond E. Davis (Vice-Chairman)
University of California

W. J. Eney
Lehigh University

Phil M. Ferguson
University of Texas

B. F. Friberg
Consulting Engineer

Herbert J. Gilkey
Iowa State College

A. T. Goldbeck
National Crushed Stone Assn.

Robert J. Hansen
Massachusetts Institute of Technology

W. C. Hansen
Universal Atlas Cement Co.

John G. Hendrickson, Jr.
Concrete Pipe Assns., Inc.

S. C. Hollister
Cornell University

A. S. Janssen
University of Idaho

E. F. Kelley
Bureau of Public Roads

Thomas B. Kennedy
U. S. Waterways Experiment Station

Ian Langlands
Council Scientific and Industrial Research Organization (Australia)

Guy H. Larson
Wisconsin State Highway Commission

D. M. McCain
Mississippi State College

W. W. McLaughlin
Michigan State Highway Dept.

O. Neil Olson
Marquette University

Douglas E. Parsons (Executive Group)
National Bureau of Standards

D. H. Pletta
Virginia Polytechnic Institute

C. J. Posey
State University of Iowa

R. I. Rowell
Vermont State Highway Dept.

Edward W. Scripture, Jr.
Master Builders Co.

T. E. Shelburne
Virginia Council of Highway Investigation and Research

J. H. Swanberg
Minnesota Dept. of Highways

M. A. Swayze
Lone Star Cement Corp.

T. W. Thomas
University of Minnesota

Stanton Walker
National Sand and Gravel Assn. and National Ready Mixed Concrete Assn.

T. F. Willis
Missouri State Highway Dept.

K. B. Woods
Purdue University

Roderick B. Young
Hydro-Electric Power Comm. of Ontario

Committee 207, Properties of Mass Concrete

Reappointments

Federico Barona de la O
Bureau of Hydraulic Resources (Mexico)

Jerome M. Raphael
Bureau of Reclamation

William R. Waugh
Office, Chief of Engineers, Dept. of the Army

Committee 208, Bond Stress

Reappointments

H. F. Gonnerman
Portland Cement Assn.
W. H. Jacobs
Rail Steel Bar Assn.
R. C. Reese
Consulting Engineer
C. P. Siess
University of Illinois
A. C. Weber
Laclede Steel Co.

Committee 210, Resistance to Erosion in Hydraulic Structures

Reappointments

Roy R. Clark
Corps of Engineers
W. T. McClenahan
Sanitary District of Chicago
A. M. Rawn
Sanitation Districts of Los Angeles County
Georg Wastlund
Swedish Cement and Concrete Institute

Committee 212, Admixtures

Reappointments

Bruce E. Foster
National Bureau of Standards
Alexander Klein
University of California
Byram W. Steele
Consulting Engineer

Committee 213, Properties of Lightweight Aggregates and Lightweight Aggregate Concrete

Reappointments

J. John Brouk
Precast Slab and Tile Co.
Alexander Klein
University of California
A. G. Timms
Bureau of Public Roads

Committee 214, Evaluation of Results of Compression Tests of Field Concrete

New appointments

T. G. Clendenning
Hydro-Electric Power Comm. of Ontario
J. D. Lindsay
Illinois Highway Department

Reappointments

Elwood H. Brown
University of California
Horace A. Pratt
University of Maine
Charles S. Whitney
Consulting Engineer

Committee 215, Fatigue of Concrete

New appointments

C. E. Kesler
University of Illinois
James P. Michalos
Iowa State College

Reappointments

Fred Burggraf
Highway Research Board
G. S. Paxson
Oregon State Highway Department

Committee 312, Plain and Reinforced Concrete Arches

Reappointments

Boyd G. Anderson
Ammann and Whitney
Clyde T. Morris
Ohio State University

Committee 314, Rigid Frame Bridges

Reappointments

Milton Brumer
Ammann and Whitney
George J. Kerekes
Bechtel Corp.
T. Y. Lin
University of California
James P. Michalos
Iowa State College
V. G. Szebehely
Virginia Polytechnic Institute

Committee 315, Detailing Reinforced Concrete Structures

New appointments

Louis F. Balser
Bureau of Yards and Docks
A. G. Casto
Truscon Steel Co.
James N. De Serio
Consulting Engineer
Paul W. Norton
Consulting Engineer

George H. Paris
Portland Cement Assn.
Howard M. Zimmerman
General Services Administration

Reappointments

Raymond Archibald
Bureau of Public Roads
Everett E. Ebling
Bethlehem Steel Co.
Lynn H. Hench
Office, Chief of Engineers, Dept. of the Army
John M. Kerr
Veterans Administration
Charles J. Kuhn
Kuhn Construction Co.
Henry L. Neve
Bureau of Reclamation
Allen M. Reese
Consulting Engineer
John F. Seifried
Ceco Steel Products Corp.

Committee 318, Standard Building Code

New appointments

Delmar L. Bloem
National Sand and Gravel Assn.
Howard M. Zimmerman
General Services Administration

Reappointments

J. P. Thompson (Secretary)
Portland Cement Assn.
Miles N. Clair
Thompson and Lichtner Co., Inc.
A. E. Cummings
Raymond Concrete Pile Co.
Joseph DiStasio
Consulting Engineer
Robert O. Jameson
Thomas, Jameson and Merrill
Vernon P. Jensen
C. F. Braun and Co.
Robert C. Johnson
Designing and Consulting Engineer
George E. Large
Ohio State University
Nathan M. Newmark
University of Illinois
Douglas E. Parsons
National Bureau of Standards
A. Carl Weber
Laclede Steel Co.
C. H. Westcott
Westcott Engineering Co.
C. A. Willson
American Iron and Steel Institute

Committee 321, Design of Reinforced Concrete Slabs, Joint ACI-ASCE

New appointments

Eivind Hognestad
Portland Cement Assn.
Jacob Karol
Howard, Needles, Tammen and Bergendoff

Reappointments

Leo H. Corning
Portland Cement Assn.
O. G. Julian
Jackson and Moreland
Chester P. Siess
University of Illinois

Committee 323, Prestressed Reinforced Concrete, Joint ACI-ASCE

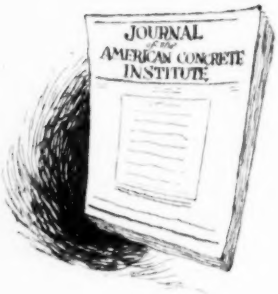
New appointments

Paul W. Abeles
Chartered Structural Engineer
Walter Blessey
Tulane University
T. Y. Lin
University of California
H. Kent Preston
John A. Roebling and Sons Co.
C. P. Schantz
Pennsylvania Railroad

Reappointments

Curzon Dobell
Preload Enterprises, Inc.
Thor Germundsson
Portland Cement Assn.
Jack R. Janney
Portland Cement Assn.
Gustave Magnel
University of Ghent (Belgium)
Nathan M. Newmark
University of Illinois
Niels M. Plum
Danish National Institute of Bldg. Research
Chester P. Siess
University of Illinois
Howard Simpson
Massachusetts Institute of Technology

Have you wished afterwards that you had saved your Journal issue?



"The ACI Journal had a paper on the subject that could answer my question, but I can't find that issue."

● If you've been caught in that predicament (and who hasn't?), then it would be a good idea to do as hundreds of Members and subscribers already do—Place a "continuation order" with the Institute for its annual bound volumes.

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Committee 324, Precast Reinforced Concrete Structures

Reappointments

Boyd G. Anderson
Ammann and Whitney
Louis P. Corbetta
Corbetta Construction Co., Inc.
E. G. Odley
Bureau of Yards and Docks

Committee 325, Structural Design of Concrete Pavements for Highways and Airports

Reappointments

Henry Aaron (Secretary)
Civil Aeronautics Administration
A. T. Goldbeck
National Crushed Stone Assn.
L. A. Palmer
Bureau of Yards and Docks
Thomas B. Pringle
Office, Chief of Engineers, Dept. of the Army
C. A. Willson
American Iron and Steel Institute
F. N. Wray
Highway Research Board

Committee 326, Shear and Diagonal Tension, Joint ACI-ASCE

New appointment

Ivan M. Viest
University of Illinois

Committee 505, Design and Construction of Reinforced Concrete Chimneys

Reappointments

Miles N. Clair
Thompson and Lichtner Co., Inc.
K. B. Foster
Rust Engineering Co.
Edmund W. Reeve
M. W. Kellogg Co.

Committee 604, Winter Concreting Methods

Reappointments

Miles N. Clair
Thompson and Lichtner Co., Inc.
Louis R. Forbrich
Pittsburgh Coke and Chemical Co.
R. W. Spencer
Southern California Edison Co.
Charles E. Wuerpel
Marquette Cement Manufacturing Co.

Committee 609, Compaction of Concrete by Mechanical Means

Reappointments

H. L. Flodin (Secretary)
Portland Cement Assn.
J. Kacmarik
Chicago Pneumatic Tool Co.
Lewis H. Tuthill
Bureau of Reclamation
George W. Washa
University of Wisconsin

Committee 611, Inspection of Concrete

Reappointments

David Ehrenpreis
L. F. Davis and Co., Inc.
Nomer Gray
Ammann and Whitney
William T. Neelands
Corps of Engineers
Wilfrid Schnarr
Hydro-Electric Power Comm. of Ontario
Lewis H. Tuthill
Bureau of Reclamation
Roderick B. Young
Hydro-Electric Power Comm. of Ontario

Committee 612, Recommended Practice for Curing Concrete

New appointment

Francis A. McAdam
Dewey and Almy Chemical Co.

Reappointments

G. E. Burnett
Bureau of Reclamation
H. F. Clemmer
Government of the District of Columbia
F. V. Reagel
Missouri State Highway Department
Paul M. Woodworth
Waylite Co.

Committee 613, Recommended Practice for Proportioning Concrete Mixes

Reappointments

W. A. Cordon (Secretary)
Bureau of Reclamation
A. T. Goldbeck
National Crushed Stone Assn.
Frank H. Jackson
Bureau of Public Roads

Thomas B. Kennedy
U. S. Waterways Experiment Station
H. C. Ross
Hydro-Electric Power Comm. of Ontario
Stanton Walker
National Sand and Gravel Assn. and
National Ready Mixed Concrete Assn.

Committee 616, Recommended Practice for the Application of Paint to Concrete Surfaces

Reappointments

F. O. Anderegg
Anderegg Laboratories
Bernard A. Malm
Sears, Roebuck and Co.
Clara Sentel
National Bureau of Standards

Committee 617, Specifications and Recommended Practice for Concrete Pavements and Bases

New appointment

John A. Bishop
U. S. Naval Civil Engineering Research and Evaluation Laboratories

Reappointments

A. T. Goldbeck
National Crushed Stone Assn.
Fred Hubbard
National Slag Assn.
Ted J. Kauer
Ohio Turnpike Commission
Stanton Walker
National Sand and Gravel Assn. and
National Ready Mixed Concrete Assn.

Committee 620, Construction Joint Practice

Reappointments

A. L. Pauls
J. A. Jones Construction Co.
Byram W. Steele
Consulting Engineer
I. L. Tyler
Portland Cement Assn.

Committee 621, Aggregate Selection, Preparation, and Handling

Reappointments

A. T. Goldbeck
National Crushed Stone Assn.
W. R. Johnson
Corps of Engineers
R. W. Spencer
Southern California Edison Co.
A. G. Timms
Bureau of Public Roads
Stanton Walker
National Sand and Gravel Assn. and
National Ready Mixed Concrete Assn.

Committee 711, Precast Floor Systems for Houses

New appointment

Merwin G. Beavers
Texas Concrete Products Corp.

Reappointments

Leo M. Legatski (Secretary)
University of Michigan
Ralph W. Adams
Consulting Engineer
Harold B. Hemb
Concrete Products, Inc.
C. A. Willson
American Iron and Steel Institute

Committee 716, High-Pressure Steam Curing

Reappointments

R. L. Barbehenn
Asbestos-Cement Products Assn.
C. R. Eckert
Ruberoid Co.
Noel Harter
Harter Marblecrete Stone Co.
Samuel B. Helms
Lehigh Portland Cement Co.
Harold J. Levine
National Brick Corp.
Lansing S. Wells
National Bureau of Standards

Autoclave building products meeting

The Autoclave Building Products Assn. held a meeting May 18, 1953, in Chicago, Ill., for the purpose of organizing committees to promote research work and to work in cooperation with ACI Committee 716, High-Pressure Steam Curing, regarding standards, specifications, and research work for the promotion and improvement of concrete products. Committees were set up to develop an association research program, finance, and to handle other activities.

New Medical and Dental School under construction at University of Buffalo. James, Meadows and Howard, architects; James N. DeSerio, consulting engineer; and The John W. Cowper Co., Inc., general contractor.

880 tons of fabricated reinforcing bars in new Buffalo medical-dental school

The new Medical and Dental School now under construction at the University of Buffalo will accommodate 80 medical students and 100 dental students. The H-shaped building, varying in height from two to five stories, provides 200,000 sq ft of floor area for classrooms, laboratories, amphitheaters, library and administrative offices. The concrete framing of the new building contains 880 tons of Bethlehem Reinforcing Bars.

These bars, made from entirely new-billet steel, were fabricated in Bethlehem's nearby Lackawanna Plant to meet the exact and varying specifications for the school. They were first sheared to proper length and accurately shaped on bending machines. They reached the job-site bundled and tagged, with bar lists included.

Specially designed lugs, high and closely spaced, give Bethlehem Reinforcing Bars firm anchorage in concrete. These lugs minimize slippage at working loads and check the formation of wide tensile cracks.

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Positions and Projects — ACI Members

Hognestad and Carlson appointed to PCA staff positions

Dr. A. Allan Bates, vice-president for research and development, Portland Cement Assn., recently announced the appointment of Dr. Eivind Hognestad as manager of the Structural Development Section of PCA's development department succeeding C. C. Carlson who has been appointed manager of the newly formed Products and Applications Section.

Eivind Hognestad

Prior to joining the association Dr. Hognestad was research associate professor in the Department of Theoretical and Applied Mechanics, University of Illinois, Urbana. He holds an MS degree from that university, and the degrees of Civil Engineer and Doctor of Technical Sciences from the Norwegian Institute of Technology.

Dr. Hognestad has been an ACI member since 1947 and is a member of ACI-ASCE Joint Committees 321, Design of Reinforced Concrete Slabs; 326, Shear and Diagonal Tension; and 327, Ultimate Load Design.

Under the management of Mr. Carlson the newly formed Products and Applications Section will continue previous studies of concrete products and in addition will pursue and study new products and applications for portland cement.

Warner retires

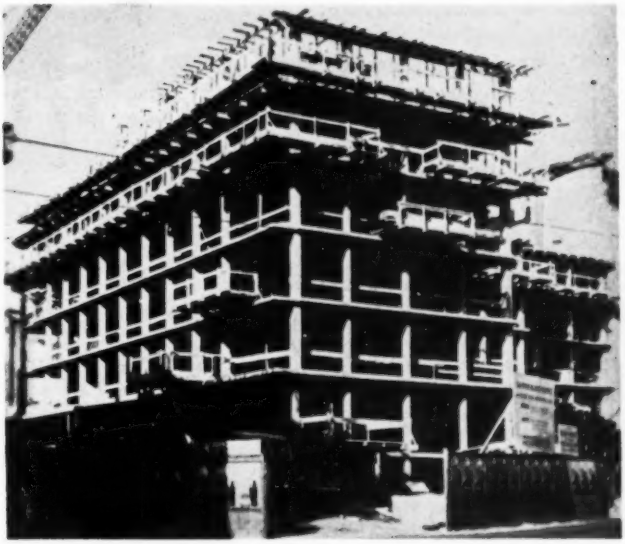
Irving Warner, vice-president in charge of engineering and purchasing, Warner Co., Philadelphia, Pa., retired recently from active service after almost 49 years with the company. He will continue as vice-president in an advisory capacity.

Mr. Warner joined the company in 1904 following graduation from Cornell University with a degree in mechanical engineering. In 1915-16 he supervised construction of the lime plant at Cedar Hollow and the building of the first rotary kiln in the East. In 1922 he went to Bellefonte as general manager and chief engineer. During his years with the company, Mr. Warner has contributed many developments to the industry, among them being the steel lime storage bin which he built at the McCoy plant and later at Cedar Hollow. Other developments include the mechanical system of handling, cooling, screening and loading lump lime, and the development and successful operation of the first continuous system of pressure hydration of lime, for which he held a patent.

Wells accepts new position

J. M. Wells recently resigned as civil engineer, Corps of Engineers, U. S. Army, Seattle District, to accept the position of chief concrete engineer with Knappen-Tippetts-Abbett-McCarthy, Engineers, firm for the supervision of construction of the Peligre Dam on the Artibonite river in Haiti. The Peligre Dam, a massive buttress concrete structure, is part of the Artibonite Flood Control, Irrigation, and Drainage Project being designed by the Knappen-Tippetts-Abbett-McCarthy firm, New York, N. Y., for the Artibonite Water Development Authority in Haiti.

This *nine* story cast-in-place Vacuum Concrete structure was built in *eight* weeks; it could have been done even faster.



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Geneva
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√ SPEEDS OPERATIONS
√ CUTS DELAYS

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Cross retires

Hardy Cross, who retires this month as Yale University's Strathcona professor of engineering, is a well-known civil engineering teacher but he is even better known as the originator of new methods of structural engineering analysis, notably the moment-distribution method of computing stress in rigid frames. Outside of his own field, he developed a standard method of analyzing flow in water distribution systems.

His first academic post as a civil engineer at Brown University came after he got an advanced degree at Harvard in 1911. In 1918 he left Brown to take up general engineering practice; but in 1921 he returned to teaching when he became professor of structural engineering at the University of Illinois. It was while at Illinois that the "Hardy Cross Method" was published in the early 1930's. He left Illinois for Yale in 1937.

His society memberships include Tau Beta Pi, Sigma Tau, Sigma Xi, Chi Epsilon, ACI, SPEE, ASCE, and AREA. His professional society recognitions include the ACI Wason Medal for the most meritorious paper in 1935, "Why Continuous Frames?" and the Norman Medal (1934), highest honor bestowed by ASCE, for "Analysis of Continuous Frames by Distributing Fixed End Moments."

Professor Cross has been active in engineering society work, written many important papers including several for the Institute of which he has been a member since 1924.

Taskin returns to Turkey

Ferruh Taskin, who has completed two years' laboratory practice at the Institut fur Bauförschung, Stuttgart, Germany, has returned to Istanbul, Turkey, as instructor at the Malzeme Laboratuari, Teknik University.

Karrer in Israel

Wilfred L. Karrer, construction engineer for the U. S. Bureau of Reclamation, is now in Israel as irrigation adviser to the United States technical cooperation director in the development of the Israeli national irrigation water supply. Previously Mr. Karrer had been working on the Kennewick Division of the Yakima project in Washington.

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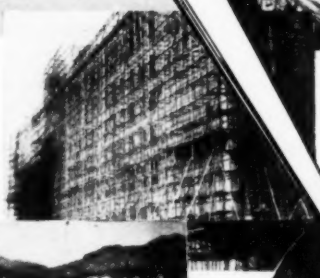

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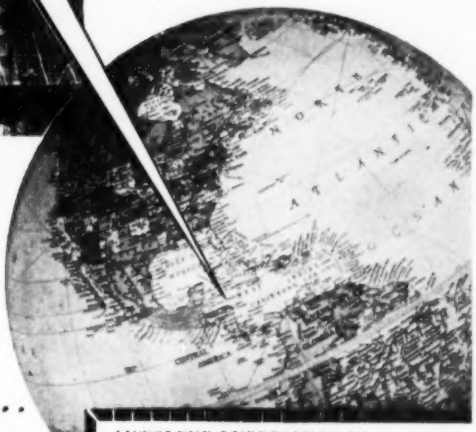
This giant state-sponsored project used Protex air entraining agent for high quality concrete under normally unfavorable labor and climatic conditions.



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Coff speaks at convention

L. Coff, internationally known consulting engineer, New York, N. Y., was a guest speaker last month at the annual convention of the Rail Steel Bar Assn.

Mr. Coff, who pioneered in the application of prestressed concrete methods for industrial and roadway construction in the United States, addressed the association on "The Possibilities of Rail Steel for Prestressing." In this paper he described tests made under his supervision last year in the Bronx, N. Y. This experiment to determine bridge load capacity with prestressed rail steel on 31-ft span beams indicated that tensioned bars could carry heavier loads than ordinary bars. Two 1-in. bars were stressed to support 10 tons of loading on the long beam.

"Ordinary steel when used to reinforce concrete would crack the concrete surrounding it," Mr. Coff explained, "but if the steel were sufficiently tensioned before being bonded with the concrete, cracking would not result. Also, the strength of the concrete would be used to better advantage."

Hasse retires

Otto C. Hasse, chief chemist of Monarch Cement Co., Humboldt, Kan., has retired as head of the laboratory after 28 years of service with the company. A graduate of Case Institute of Technology, Cleveland, Ohio, with a degree in chemistry, Mr. Hasse joined the Crescent Co. plant at Wampum, Pa., in 1904 and served as chief chemist for over 17 years. He resigned in 1921 to accept the position of superintendent of the Bessemer Limestone and Cement Co., Bessemer, Pa. Four years later he became chief chemist at Monarch Cement Co.

Rogers honored

Lester C. Rogers, president, Bates and Rogers Construction Corp., Chicago, Ill., was among those named by the University of Wisconsin as the nation's "leading engineers and industrialists." He is a graduate of the university's college of engineering and was cited for his accomplishments at the annual Engineers' Day celebration on April 10.

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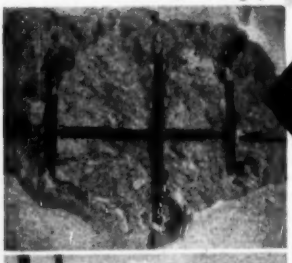

Typical example of spalling. Note corrosion of reinforcing rods exposed by disintegrating concrete.

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Report of ACI membership vote on revision of ACI Standard 711-46

On May 29, 1953, the secret letter ballots on revision of ACI Standard 711-46 were canvassed. The membership approved the "Proposed Revision of Minimum Standard Requirements for Precast Concrete Floor Units (ACI 711-46)," (Report of ACI Committee 711, ACI JOURNAL, November, 1952, p. 169) with the following amendments:

Section 40, paragraph (b)
Insert footnote reference after tests and add the following footnote: *In this Standard, a field test is a test made on a floor or roof area in place in a structure.*

Figures
In caption or drawing of Fig. 1, 3, 5, 9, and 10 add statement indicating that dimensions are *typical.*

The revised Standard will be published in the September, 1953, ACI JOURNAL.

Air-entraining agents now used in 60 percent of all concrete

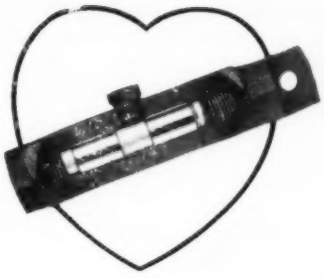
Air-entraining agents for concrete, first introduced about ten years ago, now are used in an estimated 60 percent of all concrete placed today, according to a recent issue of *Chemical Week.* The present market requires about $1.5 millions' worth.

With construction booming this year sales of additives are expected to go even higher, the magazine says, and may soon be used in nearly all concrete. A very small proportion is needed—½ oz of the liquid additive per bag (94 lb) is a typical amount. For mill-added types, the additional cost to make an air-entraining cement is less than a cent per barrel (374 lb).

Major use of air-entrained concrete today is for highway construction; but all sorts of concrete construction—building block, concrete pipe, dams, bridges, irrigation ditches—are found to benefit from the small bubbles of air.

Calaveras announces election

The Calaveras Cement Co., San Francisco, Calif., recently announced the election of the following new vice-presidents: Arnold Ross, formerly assistant vice-president; M. J. London, formerly general sales manager; and E. M. Barker, formerly plant manager. The company also announced that Grant W. Metzger was appointed acting plant manager.



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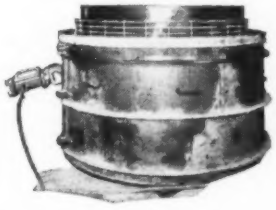

For instance, smoother, denser concrete pipe, in sizes up to 72" diameter is now being produced in a greatly reduced casting time by The Leonard Concrete Pipe Company of Hamden, Conn., thru the use of Branford vibrators.

Lively movement of sand, aggregate, cement, etc., without arching and clogging, is produced in hoppers and chutes by Branford vibration. Railroad cars are unloaded smoothly and quickly by the use of Branford Vibrators.

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Sand blasting concrete masonry walls enhances appearance

The texture and color tone of concrete block may be greatly improved by a treatment of light sand blasting. This technique was used recently by Mac Isaac and Menke Co., general contractors of Los Angeles, while doing construction work for the Consolidated Western Steel Co., Division of U. S. Steel, at the Maywood plant.

Exterior walls were erected with block having a composition of volcanic lava aggregate with a slight reddish cast grayed down by the cement binder. A light sand blasting of the completed wall resulted in exposing the red aggregate slightly and gave a new depth of color tone.

Cost of the surface finishing by this method was found to be higher than painting because of the necessity of applying waterproofing to the block after blasting. Cost of blasting each 1200-ft unit of surface was approximately $100, said to be about equal to the cost of painting. Waterproofing the same area came to about $60. Blasting time for each 1200-ft unit was 5 hr.

Air was supplied for the blasting by a 500-cfm diesel powered air compressor but the contractor points out that half this capacity would be sufficient for the work. The sandblasting equipment and sand pot were truck mounted.

Among the prime requisites of good results for this treatment, according to MacMen, are that the nozzle man must be an experienced sandblaster. He must be able to bring out the texture of the block without damaging the joints. He must be able to adapt his handling of the nozzle to the density of the surface encountered. This was accomplished by going over the surface twice. After the first light blasting both soft and hard spots showed up in contrast and a second blasting over the hard areas smoothed out the work. The blasting was not done until several days after the wall was constructed, to allow time for proper setting.

Determination of the exact color tone which will result from sand blasting block is important before starting the job, it was pointed out by Mac Isaac and Menke. This may easily be done simply by chipping the surface with a sharp tool, they said.

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NSPE meets

Members of the National Society of Professional Engineers gathered in Daytona Beach, Fla., June 18-20, for the society's annual meeting which included among its highlights the presentation of the NSPE Award to the nationally-known engineer, Charles F. Kettering, and the installation of T. Carr Forrest, Jr., Dallas, Texas, as the organization's fifteenth president.

Mr. Kettering, who is vice-president of General Motors, received the award which is granted on the basis of meritorious service to the engineering profession. Bestowed for only the third time in the history of the society, the honor has previously been accorded to Herbert Hoover and D. B. Steinman.

Devoted strictly to the professional rather than the technical aspects of engineering, the meeting also featured a "State of the Profession" program on June 20. Outgoing NSPE President John D. Coleman, Dayton, Ohio, reviewed the accomplishments of the professional group during the period of his administration.

Rogers in India

Franklyn C. Rogers, until recently with the Bureau of Engineering Research, Rutgers University, New Brunswick, N. J., is now resident engineer, Harza Engineering Co., Maithon, Manbhum District, Bihar, India.

Franks elected PCA president

Carl D. Franks, who for the past 14 months has served as executive vice-president of the Portland Cement Assn., has been elected president of the association.

Carl D. Franks

Mr. Franks has served with PCA since it was established with its main offices in Chicago in 1916. After eight years as district engineer in charge of the Indianapolis office, he was appointed midwestern regional manager responsible for the activities of seven of the association's district offices covering a ten-state area. In 1948 he was made vice-president for promotion and for four years supervised all promotive activities of the association. In March, 1952, he was appointed executive vice-president, exercising the duties of president. His appointment to the presidency rounds out a career of 37 years of service with PCA.

Gonnerman enters private practice

Harrison F. Gonnerman, who retired last year from the Portland Cement Assn., Chicago, Ill., after 25 years' service on the PCA research and development staff, has set up an office in his home in Oak Park, Ill., as consulting engineer and research consultant.

Reickert joins Hazelet and Erdal

Frederick A. Reickert has joined the staff of Hazelet and Erdal, Chicago, Ill., after 20 months' active duty with the U. S. Air Force. Prior to this period of service, Colonel Reickert was an associate professor of civil engineering at the University of Illinois for three years.

Howard retires

C. M. Howard, engineer-manager, Concrete Products Assn. of Washington, Seattle, recently retired from active management after 24 years of service with the association. He will serve as consultant to the association and will be available to other clients in a similar capacity.

Mr. Howard joined the association at the time of its organization in 1929. Recognized nationally as an authority on concrete pipe, he is at present serving on ASTM Committee C-13, and has been a member of the technical problems committee of the American Concrete Pipe Assn. He has served as president of the Seattle Section, ASCE, the Seattle Post of SAME, and the Pacific Northwest Sewage and Industrial Waste Assn. He later became national director of the two latter associations. Mr. Howard has been an ACI member since 1936.

Errata

The following corrections should be made in "Chemical Reactions in High-Pressure Steam Curing of Portland Cement Products," ACI JOURNAL, May, 1953.

p. 847—the third line of the paragraph under the heading "Tricalcium silicate hydrate" should read: "....hydrolyses at least partially to $2CaO \cdot SiO_2 \cdot 1\text{–}1.25\ H_2O$ and...."

p. 851—the third line of the fifth paragraph should read: "..... $4CaO \cdot Al_2O_3 \cdot aq.$ and ....."

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Who's Who This Month

H. S. Meissner

As chairman of ACI Committee 609, Compaction of Concrete by Mechanical Means, H. S. Meissner led the session on vibration of concrete at ACI's 49th annual convention. His paper, "Compacting Concrete by Vibration," p. 885, introduced this symposium.

Mr. Meissner is a research engineer with the Bureau of Reclamation in its Denver, Colo., laboratories. He has long been active in the field of concrete and cement, as his many papers in past issues of the JOURNAL will attest.

A graduate of the University of Utah he continued his civil engineering training at George Washington University where he received an MS degree in 1929. After several years of railroad work he joined the Bureau of Reclamation when that agency began work on Hoover Dam, and has been with it since 1930. He was identified with the development of low-heat cement for that job, being in charge of the Bureau's cement laboratory. The study of pozzolanic materials, undertaken subsequently in the cement laboratory, led eventually to the use of pozzolans in eight Bureau dams. Reaction between aggregate and cement is another subject in which he has been actively engaged.

An ACI member since 1935 Mr. Meissner is also a member of ASCE, ASTM, and an associate of the Highway Research Board. He is a member of ASTM Committee C-1 on Cement, and a member of the Federal Technical Committee on Cement, Lime, and Plaster.

Sven G. Bergstrom

"Laboratory Tests on Vibration of Concrete," p. 893, are described by Sven G. Bergström, research engineer, Cement and Concrete Research Institute, Royal Institute of Technology, Stockholm, Sweden.

In 1942 Dr. Bergström received a civil engineering degree from the Royal Institute of Technology, and in 1951 a degree of Doctor of Technology from the same institute, his thesis being on buckling of arch bridges. From 1942-44 he was engaged in structural design for the Royal Board of Waterfalls.

From 1943-45 Dr. Bergström was a research assistant mainly occupied with buckling problems at the Royal Institute of Technology's Institute of Bridge and Structural Engineering. He has been engaged in his present work on concrete pavement design and concrete technology at the Cement and Concrete Research Institute since 1945.

Walter O. Crawley

"Effect of Vibration on Air Content of Mass Concrete," p. 909, introduces Walter O. Crawley, materials engineer, Waterways Experiment Station, Concrete Research Division, Corps of Engineers, Vicksburg, Miss.

After receiving a BS in civil engineering from the Alabama Polytechnic Institute he was employed by the Alabama State Highway Department on concrete highway construction. Following his highway department experience Mr. Crawley became an employee of the Corps of Engineers. In 1947 he came to the Concrete Research Division of the Waterways Experiment Station and is chief of the Mixture Design Section. Mr. Crawley has been an ACI member since 1948.

Lewis H. Tuthill

Lewis H. Tuthill, concrete engineer, Bureau of Reclamation, Denver, Colo., tells about "Vibration of Mass Concrete," p. 921.

Since graduation from Oregon State College in 1920, Mr. Tuthill has been continuously engaged in design and construction work on irrigation, water supply projects, and the building of dams, with the technique and control of concrete as his primary and absorbing interest.

Since 1939 he has been a member of the staff of the Bureau of Reclamation. While on leave of absence from the Bureau, he spent several years during World War II supervising concrete quality on the U. S.

Maritime Commission's concrete ship construction program.

Mr. Tuthill, in addition to receiving the ACI Construction Practice Award in 1945 and serving as chairman of Committee 614 whose report on "Recommended Practice for Measuring, Mixing, and Placing Concrete" became an ACI Standard in 1942, is a member of ACI Committees 213, Properties of Lightweight Aggregate Concrete; 604, Winter Concreting Methods; 609, Compaction of Concrete by Mechanical Means; 611, Inspection of Concrete; 620, Construction Joint Practice; and 621, Aggregate Selection, Preparation, and Handling. He has been an ACI member since 1926.

A. G. Timms

A. G. Timms, physical research engineer, Bureau of Public Roads, Washington, D. C., presents "Application of Vibration to Concrete Pavement Construction," p. 933.

Mr. Timms started his professional career in 1919 as a part-time laboratory assistant in the Structural Materials Research Laboratory, Lewis Institute, under the direction of D. A. Abrams, obtaining a BS degree at Lewis Institute in 1920. He spent about a year in the construction field and from 1922 until 1926 he was employed on research projects in the Portland Cement Assn.'s laboratory.

In 1926 on leave of absence, he worked with the Immel Construction Co., Fond du Lac, Wis., as concrete technician on the construction of several buildings where one of the principal problems was the placing of concrete at low temperatures. From 1943-46 he was engineer with the National Slag Assn., Washington, D. C., and in 1947 he joined the staff of the Bureau of Public Roads, Washington, D. C., as senior research engineer in the Concrete Research Laboratory.

Mr. Timms, ACI member since 1938, is a member of ACI Committees 213, Properties of Lightweight Aggregate Concrete; 609, Compaction of Concrete by Mechanical Means; 612, Recommended Practice for Curing Concrete; and 621, Aggregate Selection, Preparation, and Handling.

George W. Washa

"Vibration Practices in Pipe, Precast, and Block Manufacture," p. 945, is contributed by George W. Washa, professor of mechanics, University of Wisconsin, Madison.

Professor Washa is the author of numerous ACI papers and received the Wason Medal for noteworthy research for work reported in his 1940 paper, "Comparison of the Physical and Mechanical Properties of Hand-Rodded and Vibrated Concrete Made with Different Cements."

He was a member of the ACI Board of Direction, 1948-50; is chairman of Committee 213, Properties of Lightweight Aggregate Concrete; secretary of Committee 115, Research; and a member of Committee 609, Compaction of Concrete by Mechanical Means.

Professor Washa was graduated from the University of Wisconsin in 1930 with a BS in civil engineering and received his PhD from the same university in 1938. He has been actively engaged in research work for many years at the university. Professor Washa has been an ACI member since 1940.

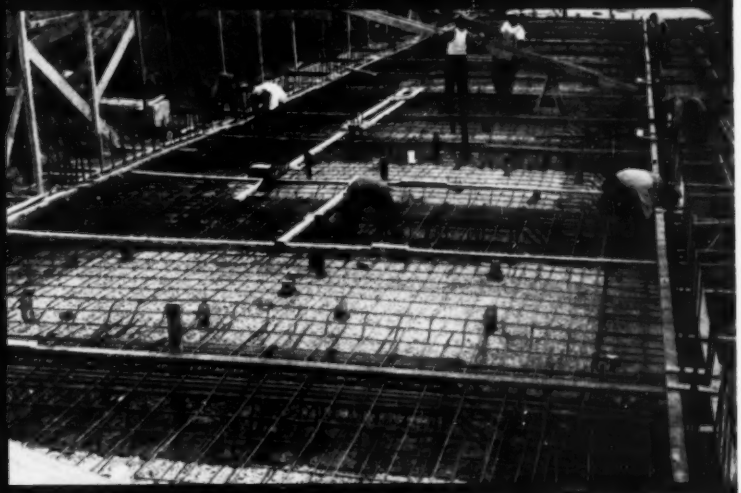
John H. Banker

John H. Banker, author of "Vibration Practices in Structural Work," p. 953, is construction superintendent, Portland Cement Assn., Chicago, Ill.

After a tour of duty during World War I, Mr. Banker worked on the West Coast for various contractors in capacities from foreman to superintendent. One of his first big jobs was the Elk Temple in Los Angeles for the Schofield Engineering Co. He then worked for Oliver G. Bowen as general superintendent on a number of jobs in the Los Angeles area; then for J. V. McNeil on the May Co. building. He also worked for Summer and Salid who built the Los Angeles Theater. From 1920-1936 he worked on a number of large buildings in the Los Angeles area and for the last two years of this period he ran his own contracting business on the West Coast.

In 1937 he began working for PCA in the capacity of construction superintendent. Since that time he has worked with outstanding engineers, architects, and contractors in the capacity of making suggestions on construction methods.

BETTER STRUCTURES



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River dam lock helps in building parkway

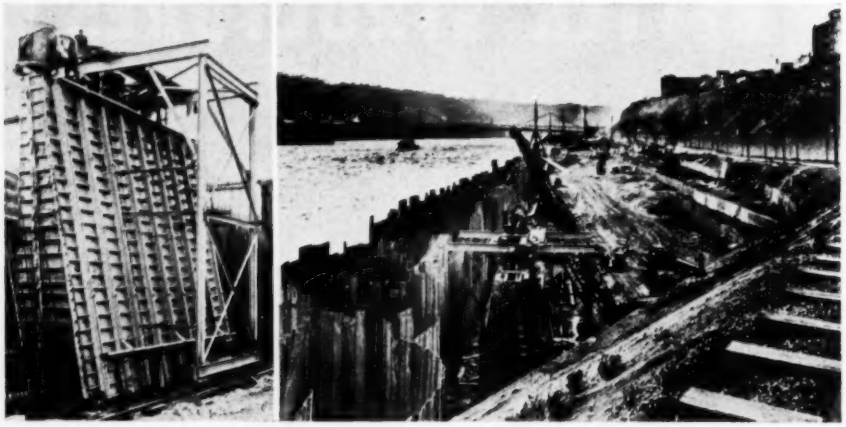


Photo courtesy Blaw-Knox Co.

Left: Steel forms in place, with gantry to aid in concrete placement, for adapting abandoned river dam lock to new use in Penn-Lincoln Parkway, Pittsburgh. Right: Over-all view of project

Pittsburgh, famous as a source of industrial "know-how," is using its industrial and engineering skills in its own civic redevelopment program. This is particularly true in meeting the physical problems involved in building the Penn-Lincoln Parkway. On part of the Bates street–to–downtown section of the parkway, engineers were faced with the problem of finding sufficient space to accommodate both the parkway and the essential Second Avenue artery. Second Avenue is presently hemmed in by the Monongahela River on one side and steep cliffs on the other.

An old abandoned river dam lock was selected as providing the opportunity for a novel solution to the problem. This lock will provide the bed for a new Second Avenue, while the old artery will be widened and adapted for use as a link of the parkway.

Monongahela River Lock No. 1, completed in 1915, had been abandoned in 1938 due to the rise in the pool level of the river resulting from construction of the new Emsworth Dam on the Ohio River. In adapting this lock for its new era of utility, piles were driven along the river side and the water was pumped out. The outer wall of the lock is to be extended to the shore. When this extension is completed, the space between the shore and outer walls will be filled and used as the base for the additional roadway, thereby making room for the parkway. Length of the outer lock wall is 680 ft, and 720 ft are being added to link it to the shore. The extension wall is 29½ ft high, 8 ft thick at the base and 2 ft at the top. The work is being done by the John F. Casey Co. of Pittsburgh.

DON'T FORGET—

there will be no Journal issues

in July and August

Cost of Blast Design*

By JOHN J. GOULD†

In general, it can be shown that the increase in cost of atomic blast design is a modest portion of the total cost. The following estimates are based on the 1950 recommendations of the Atomic Energy Commission which suggest that floors and roofs be capable of resisting a blast load of 70 psf and walls 90 psf with an increase of 33 to 50 percent in unit stresses.

Based on past experience from various California earthquakes, the author ventures to predict that engineering skill and construction know-how will soon eliminate even this small extra cost through simplifications in the design. Even if the additional cost factor would be much greater, the author would not hesitate to recommend that all structures located in possible target areas be built of fireproof materials and of blast-resistant construction.

In 1951 the author visited war damaged cities in Germany and was impressed with the ever-repeated fact that fire damage was much greater than bomb damage. A typical German city consists of a large number of buildings constructed of brick masonry walls, two to four stories high with wood floor and roof supported by unprotected steel beams. Light explosive bombs were dropped, followed by fire bombs in compact pattern which converted whole sections of the city into a wall of fire in a short time. Cities like Cologne were about 50 to 60 percent destroyed. In general, well engineered, fireproof structures suffered little damage even when occasionally subjected to direct hits. Modern office and store structures in central business areas were quickly restored to their normal function although in many cases their interiors were burned out. Industrial structures which had been built of fireproofed steel or reinforced concrete, generally suffered small damage. This was especially noticeable in the Ruhr near Dusseldorf.

*Based on a report given at the Engineering Symposium, Saint Mary's College, San Francisco, Calif., Feb. 5-7, 1953, sponsored by the Federal Civil Defense Administration, Region VIII and Western Technical Training School.

†Member American Concrete Institute, Consulting Engineer, San Francisco, Calif.

Examples of fireproof construction

Let us first consider several examples of structures that are basically fireproof.

1. The first study is that of the group of 13-story apartment houses built at Park Merced, San Francisco.‡ These buildings are of reinforced concrete with a floor area of 15,000 sq ft per floor. Compared to otherwise sound minimum construction, the additional cost of blast or a seismic design of the structure itself is 1 to 2 percent of the total cost. If we assume that the present windows were replaced with a glass or plastic capable of resisting 90 lb per sq ft blast, this cost would increase by 3.2 percent of the total. This could make the building atomic blast resistant at a total increase of 5.2 percent.

2. The next structure to be analyzed from a cost point of view is the Abraham Lincoln high school in San Francisco, now being built at a cost of $2,837,000. In addition to reinforced concrete classrooms, the school contains two large steel framed gymnasiums, three large reinforced concrete music rooms and a steel frame auditorium with a seating capacity of 1800. The school was designed to resist a lateral force of 8 percent G due to earthquake as required by the California state school code. In most cases this is a more severe design criteria than the recommended forces from atomic blast. However, there are a few conditions which would require additional strength to resist atomic forces. These conditions were investigated and the additional cost would be only about $5000. To make windows blast resistant would cost $47,000, making a total increase of 1.8 percent over the cost of the buildings as built.

3. A 15-story steel frame and reinforced concrete wall and floor telephone exchange building was built in Oakland, Calif., a few years ago at a cost of $8,000,000. The typical floor has an area of 18,100 sq ft. The building was designed for an earthquake coefficient of about 3 percent at the base,

‡For additional details, refer to ACI JOURNAL, September, 1951, p. 29, "Multi-Story Buildings Designed to Resist Earthquakes," by John J. Gould.

which is equivalent to a wind of 100 psf and is 10 psf heavier than the Atomic Energy Commission recommendations. The cost of providing the extra resistance to this lateral load as compared to a wind of 55 psf or a 2 percent earthquake factor is estimated to be about $160,000 or 2 percent of the total cost. If windows are made blast resistant, cost increases another 1 percent making a total of 3 percent.

4. The telephone exchange building at Chico, Calif., is a two story and basement, reinforced concrete structure. The building is 78 x 74 ft and cost $368,000 to build. The building was designed using the lateral force provisions of the 1949 Uniform Building Code. Upon investigating the building for atomic blast, it was found that the blast forces were not as heavy as the earthquake forces used in the design. The cost of providing resistance to earthquake was perhaps 1 percent of the total cost. The cost of making windows blast resistant would be about 1½ percent, making the total added cost 2½ percent as compared to sound minimum construction as generally used in California.

A well designed all concrete building, constructed in a workmanlike manner and with good supervision can resist atomic blast with very little increase in cost. Most of this increase arises from using windows and window framing that would resist shattering under blast.

5. Warehouses also deserve consideration. A recent design for an all reinforced concrete one-story warehouse called for a column spacing of 37 ft 6 in. x 66 ft 8 in. The roof was made of U-shaped forms similar in principle to a barrel design. The warehouse had a floor area of 195,000 sq ft for a cost of $1,080,000, This design was completely fireproofed and blast resistant with the exception of the doors and a few windows. This design cost 18 percent more than warehouses built of concrete block walls, gypsum roof, and exposed steel framing.

6. The next example is a one-story and basement store building being built for the F. W. Woolworth Co. at Santa Ana, Calif. The structure is 15,000 sq ft in plan, cost $290,000, has concrete exterior walls and first floor, and a wood roof. To make the structure fireproof and blast resistant would add 6.9 percent to the total cost including the cost of using a concrete roof in place of wood roof. The cost of making the windows blast resistant would add about 1.8 percent or a total of 8.7 percent.

7. To make a steel box type bridge of 700 ft typical spans fireproof and atomic blast resistant would add about 10-15 percent to the total cost of a four mile long bridge costing about $60,000,000.

For residential construction, typical homes could be built within close price range of present construction and still be made fire and blast resistant by using mass production methods. By using tilt-up, lift-up, precast, and prestressed reinforced concrete construction, costs could be reduced to the point that this safer type of construction would be economically feasible.

Recommendations

To assure our future generations a better chance for survival in total war, the author recommends that the professions of engineering and architecture and the building industry unite in the following efforts:

1. Initiate research, studies, and tests toward greater economy in atomic blast resistant construction.

2. Assist the civil defense authorities in the education of our people on the effects of total war.

3. Stimulate plans to disburse industries, utilities, and transportation facilities.

4. Urge the construction of fireproof and blast resistant buildings, bridges, and other structures in possible target areas.

Warzyn becomes member of engineering firm

Mead and Hunt, Inc., consulting engineers of Madison, Wis., recently announced that Willard W. Warzyn, chief structural engineer, has become a member of the firm. He has been associated with Mead and Hunt since 1947.

Henson promoted

H. Lyle Henson has been promoted from chief engineer to vice-president of the Peerless Cement Corp., Detroit, Mich.

Heavy-media flotation process used in gravel production

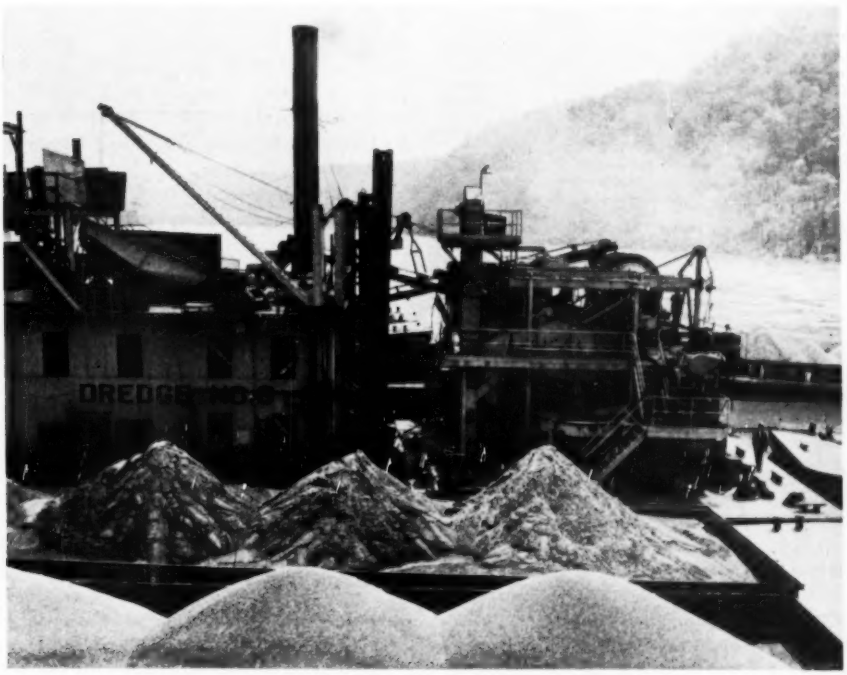
First commercial production in this country of river gravel by the heavy-media separation process has been announced by Keystone Division of Dravo Corp., Pittsburgh, Pa.

Designed to improve the quality of river gravel for use as aggregate for concrete, the process removes by separation objectionable particles of "soft" gravel, porous gravel, and foreign materials. Prior to tests of the heavy-media principle, mechanical methods of scrubbing and pulverizing had been attempted for years, with high maintenance costs and only partial success, said the company.

The new process, which had previously been employed successfully in other fields, consists of placing the feed material—gravel dredged from the Ohio River—into an artificial heavy liquid made up of finely ground material kept in suspension in water. By varying proportions, a resulting liquid of any specific gravity between 1.0 and 2.5 can be maintained. All substances in the feed of lower specific gravity will float while heavier particles sink.

To retain the flexibility of its floating sand and gravel plants, Dravo designed and constructed a separate hull to carry the necessary equipment for the process. The specially designed hull is 50 ft wide, 40 ft long, and 7 ft 6 in. deep. The plant is fed by a conveyor belt extending from the normal loading point on the dredge to a feed hopper at the top of the new plant. The finished gravel product is loaded onto barges moored alongside.

Continued on p. 29



Special equipment for the first commercial production of river gravel by the heavy-media separation process is shown alongside (right) Dravo Corp. Keystone Division Dredge No. 9 in the Ohio River. With this equipment, gravel dredged from the river is processed to remove unwanted substances to improve quality of river gravel used as aggregate for concrete

Hyperbolic cooling towers of reinforced concrete

By GEORGE L. BLANCHARD* and PAUL ROGERS†

The growing demands and uses for electric power are resulting in the construction of new and larger power stations. Simultaneously, turbogenerator units have increased in size and capacity; several units have been installed which have 150,000 kw or even larger capacity, with a corresponding demand for circulating water for the condensers. As an example, a power station of 500,000 kw capacity may require as much as 30,000,000 gal. of cooling water per hour.

Where the water supply is critical, means must be found for the cooling and re-use of the water. One system employs a wood frame with louvres and splash trays with large capacity induced draft fans creating the cooling effect. There are maintenance and replacement costs involved with such towers aside from the considerable electric power used; a 60,000-gpm tower consumes, for year around operation, more than 3,000,000 kw-hr of electric power.

*Member American Concrete Institute, Director, Intercontinental Technical Enterprises, Inc., Chicago, Ill.

†Member American Concrete Institute, Partner, Rogers & Snitoff, Inc., Chicago, Ill.

Reinforced concrete cooling towers

The construction of economical towers for cooling purposes offers a challenge to the engineering profession. It may be that hyperbolic reinforced thin-shell concrete cooling towers, as used in various European installations (see *News Letter* cover), will provide one of the successful solutions to this problem.

The towers are built of thin-shell reinforced concrete, curved in two planes, and if properly constructed, require little maintenance. Due to their great moment of inertia, such towers offer strong resistance to high winds and earthquakes. Although these towers attain great heights, the hot water is merely pumped to a height of approximately 24 to 28 ft, where it enters into distributing pipes (Fig. 1). From these

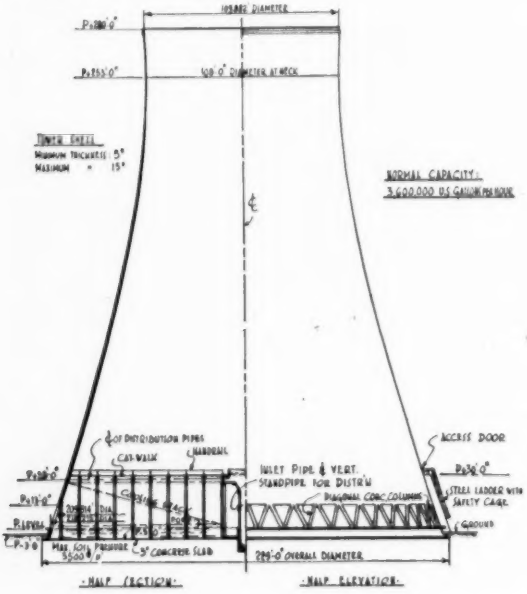


Fig. 1—Natural draft cooling tower of reinforced concrete

pipes the water is sprayed through sprinklers onto splashboards and it cools while dripping down to the collecting pond.

Cooling is produced by natural draft through the chimney effect of the tall tower; thus no induced or forced draft fans are required. The bottom of the tower acts as a collecting pond and by deepening the bottom of the pond, a storage reservoir of several million gallons capacity can be made available. Towers of 6,000,000 to 8,000,000 gal. per hr capacity are possible. Reinforced concrete towers are, of course, fireproof and this is an important factor for the so-called stand-by cooling towers.

An economical "approach" of 10 F to the ambient wet bulb temperature is feasible and as a rule not more than 1 percent make-up water is necessary. This small water loss is mostly due to evaporation, and to a small degree due to drift. Where the water supply is so critical that even this small make-up is difficult to obtain, further reduction in losses is possible through the employment of internal mechanical recuperators and through condensation-producing holes around the top of the tower.

Site applications

From an operational point of view, the use of such towers may permit the installation of condensers in the basement level, with subsequent lowering of crane girders and turbine room roof.

Power stations require large areas for coal storage. In at least one installation abroad, the hyperbolic cooling tower was elevated on long slender columns and the coal stored below the cooling tower.

Quite often, power stations built on river banks require extensive foundations due to the poor bearing capacity of the soil. Complicated cofferdams, hollow-caissons, and other expensive systems are required to support the building columns. Nearly all major rivers are affected by periodic floods and to counteract buoyancy extremely heavy mat foundations are often used. As the capacity of the station steadily increases, the various units increase to such an extent that it is not unusual to have columns which support several million pounds of loads. Consequently, it becomes increasingly difficult to provide proper foundations for such loadings. Through the use of cooling towers, the power station may be moved away from the river bank to sites with adequate bearing capacity, obtaining considerable economy in the cost of the foundations and basement walls of the main plant.

Stations which may have been designed for normal growth now find their circulating water intake facilities inadequate for the tremendous power demands. There are power stations which at present are supplied with circulating water through deep tunnels drilled in rock below the city. In some instances it may be more economical to install hyperbolic cooling towers and divert part of the present water intake toward such towers than to build new crib houses, screen-, and pumphouses, and intake and discharge tunnels, particularly if such tunnel construction is through rock and of extensive length.

Construction

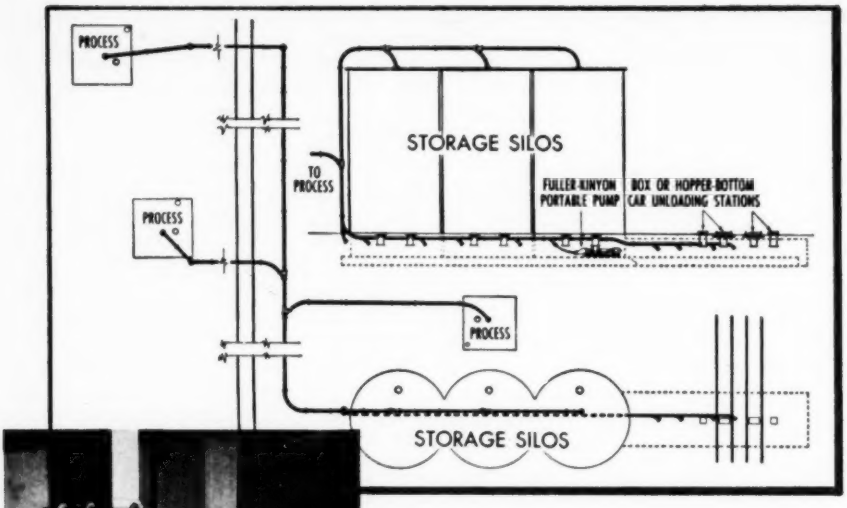
Thin-shell construction is not new in this country. Although applied mostly to roof construction, it has been employed in numerous instances with success and economy. Construction methods can be improved or altered to facilitate the placing of rotational shells about a vertical axis. In fact, some ingenious methods have been applied in South Africa, for example, where construction proceeded from a vertical structural steel mast with telescoping and rotating cantilever arms. It is within the realm of modern construction methods to produce a system whereby such thin-shell towers may be built without any formwork.

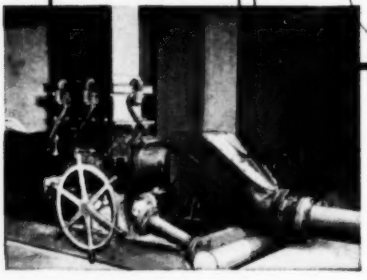
Heavy-media flotation process

Continued from p. 27

The plant was placed in operation in April, 1952, and operated during the 1952 season. While further tests will be conducted to verify results to date, considerable improvement in the quality of gravel has been noted.

An important feature of the process is that it permits dredging for gravel in areas previously considered worthless because of contamination by coal and other deleterious material. The project promises much for the producer of gravel who is now forced to work the less desirable gravel deposits.





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New Members

The Board of Direction approved 34 Individual applications, 3 Corporations, 19 Juniors and 5 Students making a total of 61 new members. Considering losses due to deaths, non-payment and resignations the total membership for the month of May is 6095.

Individual

ASHFORD, DOUGLAS W., Acton, London, England, (Partner, Clarke, Nicholls & Marcel)
FUTAMI, PROF. HIDEO, Tokyo, Japan (Res. Struct. Engr., Tokyo Institute of Technology)
LEE, THOMAS J., San Miguel Dist., Manila, Philippines (Gen. Bldg. Contr.)
MUTO, KIYOSHI, Tokyo, Japan (Research & Teaching, Tokyo University)
VISTOR, FRANCISCO J., Pasay City, Philippines (Design, Estimate & Supv., F. J. Victor Constr.)
ATKINSON, THOMAS G., La Jolla, Calif. (Lt. Com., Civil Engr. Corps., U. S. Navy)
CAPACETE, JOSE L., Santurce, P. R. (Partner, The Foundation Engineering Co. of P. R.)
COBB, EDWIN B., Boston, Mass. (Partner, Metcalf & Eddy, Engrs.)
CRANFORD, CHARLES H., Birmingham, Ala. (Sales Engr., Superock Co.)
DEMOLL, JOHN D., Phila., Pa. (Arch. & Engr., The Ballinger Co.)
FOLTZ, FRANKLIN J., Phoenix, Ariz. (Partner, Riley & Foltz, Cons. Engrs.)
FRANCO, FRANK, Detroit, Mich. (Franco & Demaestri)
GAUNT, ARNOLD R., Aurora, Colo. (Constr. Engr. & Supt., The Precon Co., Inc.)
GONZALEZ, JOSE RAMON, Ponce, P. R. (Concrete Insp., S.W.P.R.P.)
HAM, CHARLES R., Pittsburgh, Pa. (Acting Sec'y Ready-Mixed Concrete Assoc'n)
HUANG, PAO-CHYUAN, Detroit, Mich. (Struct. Engr., Smith, Hinchman & Grylls, Inc.)
JAIN, J. S., Washington, D. C. (Civil & Constr. Engr., Gov't of Punjab, India)
KARL, JOHN A., Albertson, N. Y. (Jr. Engr. Design, Drafting, Di Stasio & Van Buren)
KINICK, W. J., JR., Salt Lake City, Utah (Dist. Mgr., Pittsburgh Testing Labs.)
LEWIS, JACK R., San Diego, Calif. (Architect, A.I.A.)
LEWIS, JAMES W., Chicago, Ill. (Gen. Mgr., American Concrete Corp.)
LUFRANO, ANTHONY G., Franklin Square, L. I., New York (Assoc. & Chief Engr., Caisson Engrg. Co.)
MATHEWS, ABE W., Hibbing, Minn. (Abe Mathews Engineering Co.)
PICKENS, V. H., Quincy, Ill. (Prop., V. H. Pickens & Assoc.)
POLLARD, JAMES J., Austin, Texas (Prof. Arch. Engrg., University of Texas)
NANCE, FREDERICK S., Omaha, Nebr. (Civil, Struct. Mech. & Electr. Engr., Nance & Rossie)
ROACH, HAROLD, Los Angeles, Calif. (Pres., Harold Roach Constr. Co.)
SIMMONS, HAROLD M., Roselle, N. J. (Consult. Engr., Byrne Assoc.)
TAYLOR, W.R.C., St. Boniface, Man Canada, (Engr., Supercrete, Ltd.)
SKIRVING, EDWIN H., JR., Hatfeild, R.D., Pa. (Reg. Engineer)
VANDEGRIFT, ROBERT A., Deer Park, Texas (Plant Mgr., Flexicore of Texas)
WOOD, H. G., Columbus, Ohio (Dist. Engr., Portland Cement Assoc'n, Chicago, Ill.)
WHITCRAFT, LEWIS N., New York, N. Y. (Constr. Materials Consultant)

Corporation

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COSIO, JOSE HUGO, Columbus, Ohio (Consult. Engr., Alden E. Stilson & Assoc.)
DARIAS, RAMON, Santos Suarez, Habana, Cuba (Estructuras)
ETKIN, YESHAYAHU, Tel-Aviv, Isreal (Reinforced Concrete Designer, Municipality of Tel-Aviv)
ETZLER, PVT. ROBERT OTTO, San Francisco, Calif. (Grad. Civil Engr.)
GOLLMANN, GERHARD, Montreal, Canada (Grad. Civil Engr., Design, St. Regis Paper Co.)
GEMMELL, THOMAS M., Monagas, Venezuela (Field Engr., Creole Petroleum Corp.)
GURALNICK, SIDNEY A., Ithaca, N. Y. (Instructor, Struct. Engrg., Cornell University)
HENRY, JOHN G., Toronto, Canada (Struct. Engr., Canadian Nat'l Railways)
HOLMAN, DONALD S., Los Angeles, Calif. (Struct. Engr., Holmes & Narver, Inc.)
JAMES, JOHN E., Camden, Arkansas (Project Mgr., Farnsworth & Chambers Co., Inc.)
KOCSIS, PETER, JR., Chicago, Ill. (Prep. PCA Publications & Spec. Engrg., Portland Cement Assoc.)
O'LEARY, WALTER E., St. Albans, N. Y. (Struct., Design, Draft. Engr., Hardesty & Hanover)
SPEYER, IRWIN J., New York, N. Y. (Struct. Engr., Freyssinet Co.)
VAZQUEZ, JOSE FERNANDEZ, Manzanillo, Cuba (Civil Engr., Comision de Fomento Nacional)
VILLA, JOSE A. VENTOSE Y LA, Civil Engr., Comision de Formento Nacional, La Habana, Cuba
WASSERMAN, MOISES, Bogota, Colombia

Student

CARTY, GERARD JAMES, Notre Dame, Ind. (Univ. of Notre Dame)
GARCIA, HUMBERTO A., Notre Dame, Ind.
HANNAN, ABDUL, West Lafayette, Ind.
NEWCOMER, ROBERT W., Boulder, Colo.
SBAROUNIS, JOHN A., West Lafayette, Ind.

Honor Roll

February 1—April 30, 1953

James A. McCarthy heads the Honor Roll this month with a total of 7 credits, J. E. Jellick is second with 5, F. Thomas Collins and Samuel Hobbs are tied for third place with 4 credits each and Phil M. Ferguson is fourth with 3. What can you contribute to the growth of ACI?

James A. McCarthy	7
J. E. Jellick	5
F. Thomas Collins	4
Samuel Hobbs	4
Phil M. Ferguson	3
Arbak A. Abdalian	2
Gerard James Carty	2
Henry L. Kennedy	2
C. H. Scholer	2
Jose Fernandez Vasquez	2

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By ACI Committee 317

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Investigation of flexural members
Design of stirrups
Columns—concentrically loaded
Columns—eccentrically loaded
Design of footings
Determination of moments in building frames

45 tables and diagrams . . . . .

Coefficients (K, k, j, p) of rectangular sections
Resisting moments of rectangular sections
Areas and perimeters of bars
Minimum web depths
Coefficients (c) for compressive reinforcement for rectangular and T-sections
Spacing of stirrups
Spiral columns—size and pitch of spirals
Allowable stress on eccentrically loaded columns
Standard styles of welded wire fabric
Moments in beams with fixed ends
Coefficients for bending moments in building frames
. . . . . and many others

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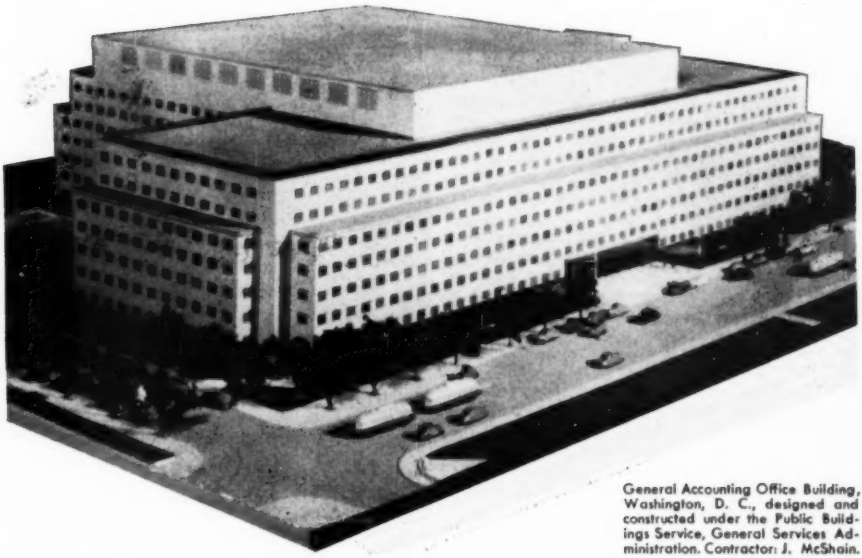

General Accounting Office Building, Washington, D. C., designed and constructed under the Public Buildings Service, General Services Administration. Contractor: J. McShain.

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Tools, Materials, Services

Under this heading note will be made from time to time of producer literature of presumed technical interest (and available from its source for the asking) to ACI users of tools, equipment, materials, accessories and special services.

"The Builders"

"The Builders," a 32-page illustrated booklet published by the Du Pont Co. is "the story of the men who build, whose labors have enlarged and widened our civilization." It provides a tribute to the men and women of Du Pont's engineering department on the 50th anniversary of the department's engineering service in the company.

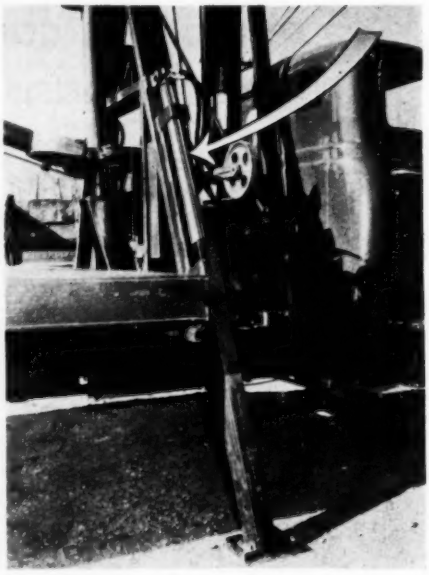
Established in 1903, the engineering department is an integration of design, research, and construction. During World War II, this Department built 58 military plants for the government. In the postwar years alone, Du Pont engineers, working 36 major projects, erected more than $800,000,000 of new plant and equipment. Now, in addition to the company's commercial construction, the booklet points out, Du Pont engineers are designing and building for the United States government the $1,300,000,000 Savannah River, S. C., atomic materials plant, probably the largest single industrial construction job of all time.

The booklet documents that plant construction today is a complicated business. As science reaches further into uncharted fields, industry's requirements grow continually more complex, its tools more elaborate. For example, with today's transport, earth-moving machinery, and powerful cranes, a crew of modest size could in less than two years duplicate the Great Pyramid, which took the Pharaoh Cheops' 100,000 slaves more than two decades of back-breaking labor to build.

"But it is not tools that represent modern construction," the booklet says, "it is the imaginations of men. Training, experience, and skills are the real ingredients. And no index of modern industry's growing complexity is as telling as the great variety of technical specialists needed to cope with today's needs. Design and construction of a modern Du Pont plant require over 100 different types of engineers, dozens of technicians, and not less than 125 types of craftsmen."—E. I. du Pont de Nemours and Co., Inc., Public Relations Dept., Wilmington 98, Del.

Tilting concrete mixer

Muller Machinery Co., Inc., has introduced the Muller 6-S tilting concrete mixer. It has a capacity of 9 cu ft of loose materials or 6 cu ft of mixed concrete. The mixer is equipped with a Briggs and Stratton air-cooled gasoline engine rated at 7.7 hp at 2700 rpm. The mixing drum is of pressed steel welded construction, and the gear ring is so located as to balance the drum for easy tilting. Details are contained in Bulletin A-24.—Muller Machinery Co., Metuchen, N. J.



Hydraulically-operated outrigger

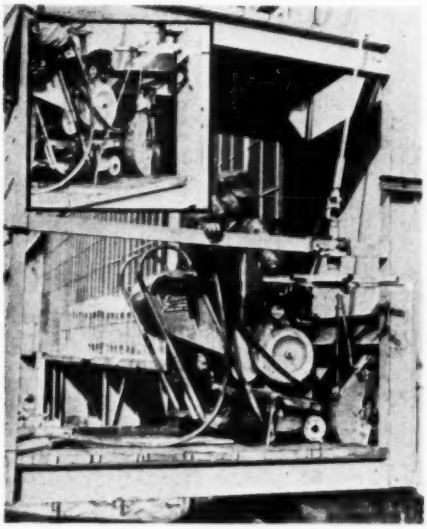
Hydraulically-operated outriggers are now available as optional equipment on the Model B Pitman Hydra-Lift, truck-mounted crane with loadline capacity of 6400 lb and power-swinging boom which telescopes from 12 to 22 ft. With the outriggers hydraulically powered, an operator can raise and lower the outrigger legs instantly simply by manipulating controls at his regular operating station. The manufacturer states this makes it possible to speed up any job where outriggers must be used frequently, such as stringing pipe and pulling paving forms.—Pitman Manufacturing Co., 300 West 79th Terrace, Kansas City, Mo.

Stainless steel wire

A 20-page booklet of technical data on the application of stainless steel wire has recently been published by Allegheny Ludlum Steel Corp. Tables of physical properties, corrosion resistance, and analysis are included. A discussion of the principal uses of stainless wire covers cold heading, weaving, heat resisting belts, rope, spring wire, slide forming, welding, and winding.—Allegheny Ludlum Steel Corp. Advertising Dept., 2020 Oliver Bldg., Pittsburgh 22, Pa.

"Engineering—A Creative Profession"

The Engineers' Council for Professional Development has published "Engineering—A Creative Profession" to give prospective student engineers a general and interesting picture of the work and opportunities in engineering. Attractively assembled, the booklet is definitely recommended reading for those high school students considering a career in engineering.—Engineers' Council for Professional Development, 29-33 West 39th St., New York 18, N. Y.



Concrete saw used to cut vertical wall during plant expansion

Anderson Brothers Contractors of Rockford, Ill., recently used a concrete saw to saw vertically up concrete walls at the Ingersoll Milling Machine Co.'s Rockford plant. This unusual sawing procedure was done to "tie in" new construction with the existing structure. By sawing to approximately one fourth the wall depth with a Model C-130 Clipper, Anderson Brothers were able to tie into the existing building wall; the sawed line confined the breaking of the concrete, leaving a smooth, neat existing corner post to which to anchor the new construction.

This vertical sawing was made possible by placing the Clipper "ConSaw" on a winch operated platform and raising the saw and operator as the job progressed. The blade guard of the saw was mounted at such a position that the front edge of the blade was exposed rather than the lower portion. The entire saw was moved upward by the saw operator elevating the platform by means of the winch.

Although the saw was not originally purchased for this vertical sawing job, this successful application shows the adaptability of this type of machine. Other uses of concrete saws are: (1) sawing transverse and longitudinal contraction joints in concrete highways, airport landing strips, and building floors; (2) sawing openings in concrete or asphalt before breaking out for repair patches in worn or failed areas; (3) sawing trenches in concrete or asphalt for the installation or repair of utility lines, sewer lines, and conduit; (4) sawing bases for installation of new machinery; (5) correcting architectural or construction errors in concrete construction; (6) sawing large stone, refractories, or concrete products such as lintels and copings which are too large for a masonry saw; and (7) sawing of precast roofing slabs.—Clipper Manufacturing Co., Suite 657, 2800 Warwick, Kansas City, Mo.

Wire tensometer for prestressed concrete research

The latest issue of "Testing Topics," V. 8, No. 2, 1953, published by Baldwin-Lima-Hamilton Corp., contains an article by Arthur R. Anderson entitled "Wire Tensometer for Prestressed Concrete Research." The wire tensometer employs SR-4 gages for measuring tension in the reinforcing wires of prestressed concrete girders.—Testing Topics, Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

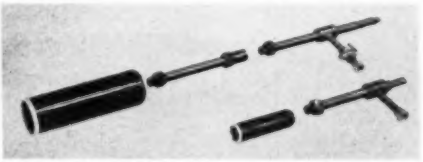
Cement paint

A simple method of attractively resurfacing porous masonry surfaces, said to successfully combat all degrees of moisture control problems, is contained in the announcement from the Reardon Co. of a new "double-waterproofed" formula. In the formula, each tiny particle of the bonding agents, which penetrate deep into the pores of the wall surface, is treated with a special waterproofer. Additional waterproofing agents and other ingredients are then milled with the bonding agents. The new formula is now being used in the manufacture of Bondex cement paint, for dampness control problems, and Bondex Heavy Duty, for serious moisture control difficulties.

The heavy-duty product is an aggregate-type wall coating for resurfacing, sealing, and patching porous masonry surfaces, and is said to be especially suited to walls which present an excessive moisture control problem. Applied with an ordinary fiber brush, it imparts a thick white coating to interior and exterior masonry walls.—The Reardon Co., 7501 Page Blvd., St. Louis, Mo.

Air entrainment

Marquette Cement Manufacturing Co. has issued a brochure, "Purposeful Entrainment of Air in Concrete," by C. E. Wuerpel, which is a simple narrative account of the "why, what, and how" of entrainment of air in concrete.—Marquette Cement Manufacturing Co., 20 N. Wacker Drive, Chicago 6, Ill.



Water feed attachment for concrete drilling

A water feed attachment for use with special Tilden rotary Koncrete Kore drills is the latest development of the Tilden Tool Manufacturing Co. Made for use with Tilden's concrete drills of 1½ to 8 in. in diameter, water flowing through the drill's core cavity removes cuttings and debris and lubricates and cools the drill. The water attachment fits standard garden hose connections. The water feed assembly includes a convenient shut-off valve for driller to control water flow.

The drills can be used in ordinary electric and air drill motors with ¾-in. chuck size or larger, and with No. 3, 4, and 5 Morse tapers.—Tilden Tool Manufacturing Co., San Clemente, Calif.

Spectrophotometers

A 28-page catalog, Bulletin 303-287, of ultraviolet and visible spectrophotometers has been released by Beckman Instruments, Inc. The brochure contains detailed descriptions and illustrations of the Model B and DU spectrophotometers—precision instruments which measure and identify substances by passing light through them. Auxiliary units as the flame, reflectance, and flourescence attachments also are described. These multiply the analytical uses of spectrophotometry without requiring a heavy outlay for new basic instruments.—Beckman Instruments, Inc., South Pasadena 1, Calif.

Foaming flotation agent

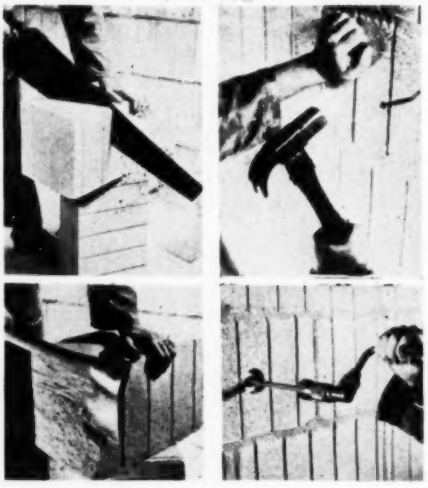
Discovery of a dairy by-product that can be used as a foaming flotation agent has been announced by Western Condensing Co. The company said the by-product is a natural rather than synthetic agent, and is nontoxic.—Western Condensing Co., Appleton, Wis.

Engine developments

Bulletin S-500-B55, "New Developments in Oil Diesel, Dual Fuel Diesel and High Compression Spark Ignition Engines," by Volney M. Holmes, has been issued by Worthington Corp. It describes and illustrates up-to-date features of modern, economical, heavy-duty, internal combustion engines. It includes a heat balance chart illustrating waste heat recoverable from exhaust gases and jacket cooling water and is accompanied by fuel cost charts for determining the most economical type of engine.—Engine Division, Worthington Corp., Buffalo 5, N. Y.

Office on wheels

The portable field office used by the concrete control section of Material Service Corp. in Chicago, as a headquarters for the foreman on the job, is made up of a 16-ft Fruehauf truck body mounted on a David Bradley (Sears, Roebuck) farm wagon truck chassis. In addition to performing the functions of a field office the unit is also used for storage of valuable tools, timekeeping records, and other necessary paper work.—Fruehauf Trailer Co., 10940 Harper, Detroit, Mich.



Lightweight building material

A lightweight mineral building material called "Zeprex" which is said to replace concrete in building superstructures, but can be sawed, drilled, cut with an axe, and nailed like wood, has been introduced into this country by United States Plywood Corp. Zeprex, a Swedish development, has been successfully used as roof decking, walls, ceilings, and floors of various types of buildings in Europe. Manufactured in slab form, Zeprex comes in 20-in. width in lengths up to 18 ft. Depending on the desired strength and insulation value, thickness may vary from 2 to 10 in. —United States Plywood Corp., Weldwood Bldg., 55 West 44th St., New York 36, N. Y.

Silicone water repellents

A 6-page bulletin issued by L. Sonneborn Sons, Inc., compares results of various silicone water repellents. —Dept. P-6, Building Products Division, L. Sonneborn Sons, Inc., 404 Fourth Ave., New York 16, N. Y.

Air-entraining agent

Mearl Manufacturing Corp. has announced a new air-entraining agent. Mearlcrete P is a reaction product of hydrolyzed proteins with other chemical additives selected to provide foam volume and stability. Among the suggested applications for the product are low density concrete and mortar, rigid thermal insulation, and lightweight building products.

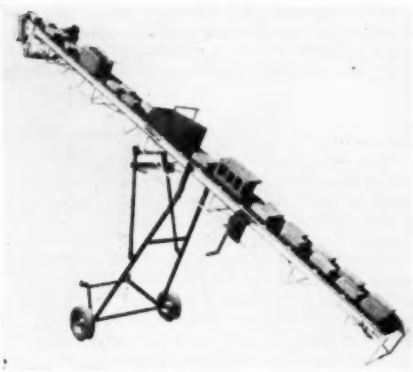
Foamed cement paste made with Mearlcrete P is said to be stable and will set to a solid foam without diminishing in volume or increasing the setting time. Varying the conditions or preparation of the foam concrete makes possible a product with density, thermal conductivity, and compressive strength to suit any need. Densities as low as 12 lb per cu ft can be attained. At 30 lb per cu ft the compressive strength of cured foamed concrete is 300 psi.—Mearl Manufacturing Corp., 153 Waverly Place, New York 14, N. Y.

Construction of shell roofs

A new process for the construction of shell type vaults, Tenco, is described in an illustrated brochure issued by American Ligurian Co., Inc., agents for "Techint," Compagnia Tecnica Internazionale, Milan, Italy. The process uses hollow precast brick joined together and reinforced somewhat similar to some types of precast joists. In constructing the arch structure by this process, the vault is built on the ground and is hoisted by jacks operating at its four corners. The vault is then lowered on to prefabricated concrete columns.—American Ligurian Co. Inc., 37 Wall St., New York 5, N. Y.

Special guards for powder actuated driver

Remington Arms Co., Inc., manufacturers of the powder actuated Model 450 Remington Stud Driver, has announced a complete line of special purpose guards for this tool. Designed for instant anchoring of special sections or fixtures to steel or concrete, the guards conform to the shape of the prefabricated sections, giving maximum coverage of the work area and fast, easy tool and fixture positioning. Each of these special guards can be rotated a full 360 deg. This new line of accessories includes guards for fastening conduit clips, structural angle and channel, "Unistrut" and "Wiremold" sections, "Loxit" channel, electrical switch, utility and outlet boxes, and lathing channel. Custom guards are available for fastening other types of sections.—Remington Arms Co., Inc., Bridgeport, Conn.



Building materials conveyor

The Model 20 trailer hoist, designed to increase the effectiveness of the Brik-Toter conveyor and to offer the construction industry a complete and self-contained operating unit for masonry materials handling, is the latest conveyor attachment introduced by the Mar-Rail Conveyor Co. Newly incorporated features of the trailer hoist are the balanced trailer and winch assembly, enabling one man to raise and operate the conveyor. A trailer hitch on the welded, steel frame secures the conveying unit to any car or truck for immediate towing.—Mar-Rail Conveyor Co., Dept. NP, 560 York Ave., Pawtucket, R. I.

Excavators and cranes

Three specification booklets giving detailed information on the Gar Wood ¾-cu yd Model 75A and Model 75B excavators and the 75BT truck cranes have been released by Gar Wood Industries Inc. These booklets show all the capacities, ranges, reaches, and attachments available for all three models.—Customer Service Dept., Gar Wood Industries Inc., Wayne, Mich.

Slab construction

A self-supporting floor developed by Products Planning Co. is said to require no joists or forms in its construction. A "Floating B Section" type of construction is claimed to eliminate joists and forms and is made to span 8, 10, 12, and combinations up to 24 ft and said to be suitable for both floor and roof deck construction.

Over the preformed B Section made from Steeltex, a lightweight high-strength concrete arched layer dries to become the form to support the high density, high-strength Heatcrete radiant heating panel or structural floor which is placed only a few days later. Both the lightweight concrete and the high density heating or structural slab are reinforced with existing materials in a new manner. For example, the floor section shown here was built to accommodate hot-air radiant heat and uses a new type expanded metal heat duct to provide the structural strength. The result is a "floating floor", which is said to require no grading, no filling, no joists, and no forms and yet the floor provides insulation and is raised off the ground to escape moisture attraction. This type of construction is stated to be especially suited to residential buildings and structures using the curtain walls now on the market.—Products Planning Co., 3318 Grant Bldg., Pittsburgh 19, Pa.

Concrete forms

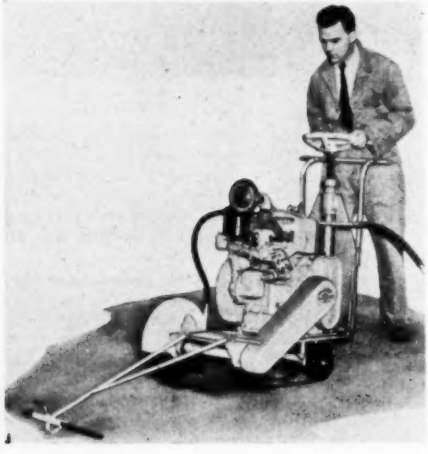
Symons Clamp and Manufacturing Co. has granted to Concrete Forms, Inc., Portland, Ore., exclusive rights for assembly, sale, and rental of the Symons forming system in the Pacific Northwest. Concrete Forms, Inc., will supply the Symons forming system to Idaho, Washington, Oregon, Montana, western Canada and Alaska through their dealer agents.—Symons Clamp and Manufacturing Co., 4249 Diversey Ave., Chicago 39, Ill.

Neoprene paint

Pennsylvania Salt Manufacturing Co. has introduced a new anti-corrosion coating using specially formulated neoprene coatings. The formulations, added to Pennsalt's regular line of corrosion resistant paints and cements, are NeoCoat and NeoPrime A (for all surfaces except concrete) and NeoPrime B (for concrete surfaces). NeoCoat is a true plastic, involving polymerization, in which the accelerator is included in the product, thus eliminating the necessity of mixing on the job. The polymerization takes place after the coating is applied.—Pennsylvania Salt Manufacturing Co., 1000 Widener Building, Philadelphia 7, Pa.

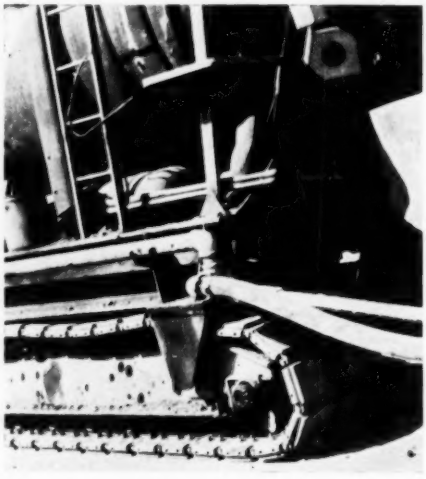
Slump concrete brick

General Engines Co. has announced a new concrete brick machine that produces up to 1500 "Rainbow Rock" brick per day. The slump concrete brick can be made in 1½, 2½, and 3½-in. thicknesses, in a variety of colors, and three types of surfaces.—General Engines Co., Gloucester, N. J.



Concrete cutter

A new concrete cutter, Model 135, has been announced by Felker Manufacturing Co. This model, of three-wheel design, is specifically designed to provide high power with light weight. It utilizes a 13.5-hp gasoline engine driving a standard 12-in. diameter diamond blade which cuts to 3½ in. deep. Larger blade diameters up to 18 in. o.d. are accommodated. Blade is mounted on a single end spindle equipped with Dodge SC self-aligning ball bearings. The diamond wheel is protected with a guard, the front half of which is hinged to raise out of the way. This permits instant cutting close to curbs and walls. Blade depth adjustment is by a manually operated screw. Coolant to the Model 135 is by external hose connection. Slotted blade collars pick up the coolant, eject it under centrifugal force over both sides of the wheel face and rim, rapidly flushing diamond section and kerf.—Felker Manufacturing Co., 1125 Border St., Torrance, Calif.



Rubber-lined crawler pads speed paving operations

A new process has recently been developed by Metalweld, Inc., whereby resilient rubber is vulcanized to steel plates and bolted to crawler pads. This permits movement of pavers over finished concrete without damaging the surface. The use of the rubber pads eliminates the expense of labor necessary to continually re-lay belting and also enables the contractor to progress faster with paving operations. Metalweld uses the B. F. Goodrich Vulcalock bonding process which joins rubber and steel together with a bond strength of over 500 psi.—Metalweld, Inc., Scotts Lane and Abbotsford Ave., Philadelphia 29, Pa.

Tractor loader

Primarily designed for outside yard materials handling, the Baker-Lull Universal Loader is available in three models—2500-, 4000- and 6000-lb capacities—and mounts on four national makes of industrial tractors: Case, Minneapolis-Moline, Shepherd, and Oliver. Prominent among loader features is a tilting tower design with ten handling attachments; double-acting hydraulic cylinders tilt the tower 20 deg forward and 9 deg to the rear of center. Lifting height of largest model is 100 in.—Dept. KP, Baker-Lull Manufacturing Co., 314 W. 90th St., Minneapolis 20, Minn.

Concrete densifier

The theory and practice of obtaining a good concrete is the subject of a new booklet, "Plastiment Concrete Densifier," published by Sika Chemical Corp. Beginning with the gel mechanics of cement-water reaction, the booklet discusses the factors affecting cement hydration and basic quality of concrete, and how these factors can be controlled to reduce cracking and increase concrete hardness and impermeability. The booklet covers eight pages of engineering information, illustrated with drawings, tests, and photographs.—Sika Chemical Corp., 35 Gregory Ave., Passaic, N. J.

Pneumatic placement of concrete

The Prehy Co., Inc., has issued two bulletins on its grouter and concrete gun. The grouter is a portable machine operated by compressed air with working pressures of up to 125 psi. It has a maximum charging capacity of 4 cu ft. The company's concrete gun is designed for pneumatic application of concrete and is also adaptable to both wet and dry sandblasting. Its normal working pressure is 30 to 80 psi and has a discharge capacity of 375 sq ft of 1-in. shotcrete per hr.—Prehy Co., Inc., 420 Lexington Ave., New York 17, N. Y.

Masonry reinforcing mesh

Adrian Peerless, Inc., manufacturers of Wal-Lok masonry reinforcing mesh, have announced several improvements in its product. Fabricated of 100,000 psi tensile strength cold drawn steel wire, Wal-Lok is now deformed and knurled; 9-gage cross bars are deep welded and project beyond $\frac{1}{4}$-in. diameter longitudinal rods. Knurling, 150 indentations per foot, 0.002 in. in depth, is said to improve bonding stress 3.2 times over plain wire. The mesh is manufactured in 12-ft lengths for 4, 6, 8, 10, and 12 in. nominal wall thicknesses.—Adrian Peerless, Inc., 1428 E. Michigan St., Adrian, Mich.

Flame photometry

"Flame Photometry—New Precision in Elemental Analysis," has been issued by Beckman Instruments, Inc., as Reprint R-56-287. The article covers the evolution, design, and utility of flame photometry in routine laboratory analysis, research, and industrial process control. One typical application described is the determination of magnesium oxide in routine quality control of Type I portland cement.—Beckman Instruments, Inc., South Pasadena 1, Calif.

Sliding-form construction

Sliding-form construction is described and illustrated in "Concretor Slipform Equipment," a 32-page booklet issued by B. M. Heede, Inc. The Concretor system, developed in Sweden, uses the hydraulic jack principle of raising slipforms. The booklet discusses types of form raising; standard slide casting machines; and slipform construction of silos, apartment houses, substructures for water reservoirs, mine shafts, factory buildings, and even bridge pillars.—B. M. Heede, Inc., 80 Broad St., New York 4, N. Y.

Aggregate producing equipment

Two new equipment bulletins have been released by Diamond Iron Works, Inc. Bulletin No. 600 gives six pages of facts and specifications on the 11 sizes of Diamond jaw crushers. The bulletin contains cut-away views of the jaw crushers and several useful charts. Included in the charts is: capacity table, toughness of various kinds of rock, and a percentage chart that tells the percentage of stone crushed and retained at any crusher setting. Bulletin No. 1000 gives specifications on the new 100 Series of three portable single pass gravel plants.—Diamond Iron Works, Inc., 1748 North Second St., Minneapolis, Minn.

Housing

National Assn. of Home Builders has issued the booklet, "Housing . . . U.S.A.," a brief reference manual on matters relating to housing. The first chapter is devoted to an outline of the broad problems and issues affecting housing and related industries. Subsequent chapters develop in detail the various aspects of the issues.—National Assn. of Home Builders, Suite 1116, 1028 Connecticut Ave., N. W., Washington 6, D. C.

Masonry cement

A booklet published by Universal Atlas Cement Co., "Good Masonry Deserves Atlas Mortar Cement," deals with those characteristics deemed desirable in a good masonry cement.—Universal Atlas Cement Co., 100 Park Ave., New York 17, N. Y.

Smith becomes administrative committee member

Blaine S. Smith, president, Universal Atlas Cement Co., New York, N. Y., under the merger of the United States Steel Co. into the United States Steel Corp., became a member of the general administrative committee.

Larmour changes positions

H. McC. Larmour is now associated with the Ideal Cement Co., Redwood City, Calif., as chief chemist. Until recently he was on the engineering staff of the Pacific Portland Cement Co., in the same city.

Officer changes jobs

John D. Officer, former assistant field engineer with the U. S. Bureau of Reclamation, Hungry Horse, Mont., has accepted a position in contract administration with Peter Kiewit Sons, Portsmouth, Ohio.

This is the last issue of Proceedings V. 49

V. 50 begins with September, 1953

Above is shown the membership certificate now available to all interested Individual, Corporation, and Contributing members. The actual certificate is 10 x 12 in. on parchment paper suitable for framing.

Return this order form together with your remittance—to avoid the added expense of billing—and your certificate will be mailed to you. Please allow 45 days for preparation of the certificate.

Please accept my order for a membership certificate at the price of $1.50.

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My name is to appear exactly as follows:

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Signature.....

ACI Synopses, Proceedings Volume 49 September 1952—June 1953 ACI

Herein are listed synopses of the papers and reports published in JOURNAL OF THE AMERICAN CONCRETE INSTITUTE Proceedings V. 49 which are available in convenient separate prints at nominal prices for specialized reading. Papers listed are examples of the 720 similar JOURNAL papers and reports listed in the ACI 20-Year Index.

SOME EFFECTS OF VIBRATION AND HANDLING ON CONCRETE CONTAINING ENTRAINED AIR.....49-1

Price 50 cents

ELMO C. HIGGINSON—Sept. 1952, pp. 1-12 (V. 49)

The effects of vibration, handling, and delay in placing concrete containing entrained air were evaluated in the laboratory with some check studies made on two large dam construction jobs. Curves of the test results show the rate at which vibration removes air from air-entrained concrete at various slumps. Loss of air caused by handling and delays in placing is determined. The effect of loss of air on the compressive strength and durability of the hardened concrete is evaluated. Evidence is presented that normal vibration does not materially affect bleeding, and that increased vibration may improve the surface appearance of concrete.

CEMENT MORTAR PIPE LININGS....49-2

Price 35 cents

J. WRIGHT TAUSSIG—Sept. 1952, pp. 13-20 (V. 49)

After discussing the reasons for deterioration of metal pipe lines, equipment for cleaning and lining them with cement mortar by the Centriline process is described. The effect of the lining on the carrying capacity of the line is considered and brief data are given on tests to determine the effect of distortion and of holes in the metal pipe on the efficiency of the lining.

FIELD PRACTICE IN LIGHTWEIGHT CONCRETE.....49-3

Price 50 cents

JOHN A. MURLIN and CEDRIC WILLSON—Sept. 1952, pp. 21-36 (V. 49)

Discusses properties of expanded shale and clay aggregates produced in Texas. Considers the use of lightweight structural concrete members and their economy as compared to heavy concrete taking into account the cost differential between the two materials. A practical and simple method for the design and control of lightweight structural concrete, both ready- and job-mixed, which has worked well in the field is discussed. Other sections deal with methods of mixing, placing, finishing and use of admixtures, and the economy of expanded clay or shale structural concrete.

USE OF CONCRETE IN RESIDENTIAL CONSTRUCTION.....49-4

Price 35 cents

C. O. CHRISTENSON—Sept. 1952, pp. 37-44 (V. 49)

Discusses the need for provisions in the ACI Building Code to meet the specific requirements of home construction. Briefly describes research in housing problems in the United States. Gives typical designs for concrete foundation slabs for homes in mild and cold climates. Illustrates the use of tilt-up construction in a multiple housing project.

PRACTICAL DESIGN OF THIN RETAINING-WALL FOOTINGS.....49-5

Price 50 cents

R. P. V. MARQUARDSEN—Sept. 1952, pp. 45-56 (V. 49)

Approximate formulas are presented for locating the points beyond which soil pressure does not affect bending and shearing stresses in the footing. A means of ascertaining the *net* vertical soil pressures and the resulting shear and bending moments is included. Once these values are established, the design of the footing may proceed in the usual manner.

ANALYSIS OF BEAM-AND-GIRDER FRAMING WITH KNOWN COLUMN SETTLEMENTS.....49-6

Price 35 cents

PHIL M. FERGUSON—Oct. 1952, pp. 77-84 (V. 49)

Systematic tabulation of data and the development of relatively simple criteria for checking the equilibrium of joints between columns make analysis by successive approximations entirely practical. Moment distribution tabulations are laid out on a plan view of the framing. Separate, but similar tabulations, are used for moments about the x-x and y-y axes. Beam-and-girder intersections are treated as joints whose elevations are first estimated. Fixed-end moments due to joint deflections are balanced; then summations of vertical forces (shears) at the joints indicate the corrections needed to move nearer equilibrium.

PROPOSED DEFINITIONS AND NOTATIONS FOR PRESTRESSED CONCRETE.....49-7

Price 35 cents

ACI-ASCE COMMITTEE 323—Oct. 1952, pp. 85-88 (V. 49)

Proposes definitions and notations for general adoption in discussing prestressed concrete and for design purposes.

EFFECT OF COMPRESSIVE REINFORCEMENT ON THE PLASTIC FLOW OF REINFORCED CONCRETE BEAMS.....49-8

Price 50 cents

G. W. WASHA and P. G. FLUCK—Oct. 1952, pp. 89-108 (V. 49)

Presents test results obtained during 2½ years of sustained loading of 34 reinforced concrete beams. Thirty of the beams were made with sand-gravel concrete containing Type I portland cement. Three conditions of reinforcement were investigated in each of five different beam sizes. One-third of the beams had only tensile steel, one-

third had tensile steel plus an equal amount of compressive steel, and one-third had tensile steel plus one-half as much compressive steel. Strain measurements at the levels of the compressive and tensile reinforcement and deflection measurements provide a clear picture of the beneficial effect of compressive reinforcement in reducing excessive plastic flow.

Four additional beams were made with only tensile steel. Two of the beams were made with sand-gravel concrete containing Type IA cement and two with a lightweight expanded slag aggregate concrete containing Type I cement. These four beams were included in the test program to provide preliminary information regarding the influence of entrained air and one type of lightweight aggregate on the plastic flow of reinforced concrete beams.

HEAVY DUTY CONCRETE FLOORS.....49-9

Price 35 cents

E. E. ECKERT—Oct. 1952, pp. 109-116 (V. 49)

Brief but specific directions for mixing, placing, finishing, and curing concrete for heavy duty concrete floors. Emphasis is on the careful control of mixing water and the selection, handling and use of a tough durable aggregate. Precautions are given for avoiding subsequent failure.

INELASTIC BEHAVIOR IN TESTS OF ECCENTRICALLY LOADED SHORT REINFORCED CONCRETE COLUMNS.....49-10

Price 50 cents

EIVIND HOGNESTAD—Oct. 1952, pp. 117-140 (V. 49)

Presents methods and results of an experimental and analytical investigation undertaken to throw new light on the behavior of reinforced concrete members subject to combined bending and axial load. Describes observations of basic behavior of such members and indicates mathematical expressions for ultimate loads.

A total of 120 column specimens were tested, of which 90 were 10-in. square tied columns with 11.46 to 4.8 percent reinforcement, and 30 were 12-in. cylindrical spiral columns with 4.25 percent longitudinal reinforcement. The concrete quality was varied from 1500 to 5500 psi, and the eccentricity of loading varied from 0 to 1.25 times the lateral dimension of the columns.

An inelastic flexural theory was developed, by means of which the behavior of the test columns may be explained, and the measured ultimate loads may be predicted with a satisfactory accuracy.

INSTRUMENTATION AND STRAIN MEASUREMENT IN WELDED WIRE FABRIC REINFORCED CONCRETE SLABS.....49-11

Price 50 cents

E. W. CARLTON and J. H. SENNE—Oct. 1952, pp. 141-152 (V. 49)

A study of the stress distribution and proper spacing of longitudinal and transverse wires in welded wire fabric. Discussed is the development of a weld-tester, to be used as a production control in the manufacture of wire fabric and as an acceptance standard for users of the product. A technique for attaching SR-4 strain gages to wire reinforcement is introduced. Charts are included to show results of tests together with discussion and conclusions.

PROPOSED REVISION OF MINIMUM STANDARD REQUIREMENTS FOR PRECAST CONCRETE FLOOR UNITS (ACI 711-46).....49-12

Price 50 cents

ACI COMMITTEE 711—Nov. 1952, pp. 169-184 (V. 49)

Proposes to change the existing Standard by adding descriptions of assembled concrete block, precast inverted T-beam joist with precast filler blocks, and inverted precast slab and T-joist types of floor units. New information is incorporated on moment bar spacing, steel requirements, distance between lateral supports, and provisions for tests. References to the ACI Building Code are brought up to date and the Appendix excerpts are taken from the 1951 Building Code. Minor editorial changes are made to clarify some of the other sections.

T-BEAM DESIGN AND THE 1951 ACI BUILDING CODE.....49-13

Price 35 cents

BENJAMIN A. WASIL—Nov. 1952, pp. 185-192 (V. 49)

Describes the design of a T-beam by use of ACI 318-51 and demonstrates that it is not simply the substitution of the new bond and shear values for those of the 1947 Code. A balance must be achieved between concrete and steel and this is done by proportioning the beam so that steel required for positive moment, when extended into the support, for compression reinforcement.

EFFECT OF TIME OF APPLICATION OF SEALING COMPOUND ON THE QUALITY OF CONCRETE.49-14

Price 35 cents

G. E. BURNETT and M. R. SPINDLER—Nov. 1952, pp. 193-200 (V. 49)

Laboratory experiments with mortar specimens indicate an advantage for applying curing compound to unformed concrete at approximately the time of set. Loss of mixing water from evaporation up to this point is shown to be beneficial to strength and abrasion resistance. Subsequent loss is shown to be detrimental. The benefit from loss of water before set appears to be directly related to the decrease in water-cement ratio.

DEVELOPMENT OF A DEVICE FOR THE DIRECT MEASUREMENT OF COMPRESSIVE STRESS.....49-15

Price 50 cents

ROY W. CARLSON and DAVID PIRTZ—Nov. 1952, pp. 201-216 (V. 49)

Describes the development, analysis, and testing of a device called a "stress meter" which measures compressive stress in concrete more or less directly. It shows that it is possible to make an embedded device which at all times registers very nearly the same stress as the surrounding concrete, regardless of the deformations, and it reports tests wherein stress meters embedded in a concrete specimen were shown to be practically insensitive to creep under sustained load and to maintain the same zero-stress reading when the specimen was subjected to a variety of conditions. The stress meters also indicate very nearly the correct stress when loaded at various ages, although the modulus of elasticity of the concrete changes markedly.

SULFATE RESISTANT CEMENT—PRIMARY REQUIREMENT FOR SULFATE RESISTANT CONCRETE PIPE.....49-16

Price 35 cents

DALTON G. MILLER—Nov. 1952, pp. 217-224 (V. 49)

Results are cited of long-time tests of 19 regular portland cements and 19 companion cements from the same mills which had been modified by raising the iron-alumina ratio from an average of 0.45 to 0.96, thus reducing the calculated compound tricalcium aluminate (C_3A) from an average of 10.0 to 4.7 percent. The marked influence of changes in the percentage of C_3A on the sulfate resistance of a portland cement is discussed.

FREE-SPAN PRESTRESSED CONCRETE BRIDGE.....49-17

Price 35 cents

U. FINSTERWALDER—Nov. 1952, pp. 225-232 (V. 49)

Short description of prestressing system and construction of the bridge over the Neckar river in Neckarrems, Germany, using a free-span prestressed concrete system.

BRACING WALLS FOR MULTISTORY BUILDINGS.....49-18

Price 50 cents

NORMAN B. GREEN—Nov. 1952, pp. 233-248 (V. 49)

Methods are developed for the stress analysis and design of the multistory reinforced concrete bracing wall, by treating it as a special type of beam and column frame having relatively wide members. Elastic requirements for a bracing wall are established. There is a discussion of the general problem of lateral load distribution to bracing walls and an entirely new method of distribution is presented, which equalizes wall deflections.

SPACING OF SPLICED BARS IN TENSION PULL-OUT SPECIMENS...49-19

Price 50 cents

S. J. CHAMBERLIN—Dec. 1952, pp. 261 276 (V. 49)

The effect of spacing of parallel bars was investigated with tension pull-out specimens. Prisms of concrete, square in cross section and of variable length, contained three bars, one bar was embedded along the vertical axis and extended downward, two other bars paralleled the center bar and extended upward. Slip of the center bar was measured at both the loaded and free end. Symmetrical spacing between the bars, from adjacent-tied to a clear separation of three bar diameters, was the major variable. Three different concretes and three types of bar—plain, one type of old-style deformed, and one type of new high-bond—were included.

Results indicate that the bond of plain bars is not appreciably affected by spacing of the bars. Bars having one type of old-style deformations and bars having one type of deformation meeting current requirements for deformed bars developed better average bond stresses in adjacent-tied splices even without mechanical interlock than in spaced splices. Spacings, other than adjacent-tied, do not appear to affect bond significantly.

STABILITY OF THIN-SHELLED STRUCTURES.....49-20

Price 50 cents

GEORGE C. ERNST—Dec. 1952, pp. 277-292 (V. 49)

A brief history of the development of various theories for determining the failing load for structural members subjected to compression provides the background for the presentation of test results confirming the validity of certain concepts. The two most widely accepted and used methods are presented, namely the empirical and tangent-modulus methods, with specific adaptation to thin-shelled reinforced concrete construction. Past tests are reviewed briefly and a series of new tests are presented to illustrate thin-shelled instability characteristics, as well as to confirm the use of either of the two methods.

EARLY FREEZING OF NON-AIR-ENTRAINING CONCRETE.....49-21

Price 35 cents

DONALD C. McNEESE—Dec. 1952, pp. 293-300 (V. 49)

The critical period when freshly placed concrete is damaged by freezing has not been definitely established. To obtain data on this subject, test cylinders were frozen at various intervals up to 6 hr after molding and at temperatures from 25 to −15 F. Cylinders molded at 72 F and subjected immediately to a freezing temperature of 15 F lost about 40 percent of their compressive strength. When given more time to set before freezing, the damage was less. There was practically no loss of strength when the cylinders set 6 hr before freezing at 15 F. Cylinders exposed to 5 F lost 50 percent of their strength when frozen immediately, and 15 percent when frozen after 6 hr.

A more critical condition existed when concrete was mixed from cold materials. Cylinders molded at 40 F lost 50 percent of their compressive strength when frozen at the mild temperature of 25 F. Concrete molded at 40 F and frozen immediately at −15 F lost 45 percent of its strength. A 50 percent loss of strength was about the maximum for any freezing condition. The length of time the concrete remained frozen or the temperature to which it was lowered once it was frozen through did not greatly affect the compressive strength.

DETERMINING CABLE PROFILES FOR PRESTRESSED CONCRETE BEAMS.....49-22

Price 35 cents

ELIHU GEER—Dec. 1952, pp. 301-304 (V. 49)

A method is presented for constructing a diagram for determining satisfactory cable profiles for prestressed concrete beams in which compressive stress is critical at only the section of maximum moment. A second method is presented for satisfying all conditions imposed by permissible stress, tensile and compressive, in a beam of varying depth and in a continuous beam.

METHOD FOR PREPARING SR-4 STRAIN GAGES FOR EMBEDMENT IN CONCRETE.....49-23

Price 50 cents

EDWARD C. THOMA and ROBERT E. SCHNEEBELI—Dec. 1952, pp. 305-316 (V. 49)

It has long been appreciated that analysis of concrete structures might be improved if a suitable means could be established for determining the behavior in the interior of a concrete mass. The very nature of its manufacture produces a heterogenous material, thereby invalidating the assumption of homogeniety which can be applied with reasonable truth in developing theoretical analysis of most engineering materials. Aggregate distribution within the mass, gradation, maximum particle size and other variables influence the behavior of a concrete structure.

This paper presents a procedure for preparing and installing the SR-4 wire resistance strain gage within a concrete mass for the purpose of determining the behavior in the interior. Controlled laboratory studies of the gage unit itself, as well as gage units embedded in mortar and concrete, are reported to establish the reliability of the prepared SR-4 gage. In addition, preliminary studies of a field application, namely a highway slab installation, are included since they further establish the practicality and long-range reliability of the gage under severe test conditions

LIMIT ANALYSIS OF VOUSSOIR (SEGMENTAL) AND CONCRETE ARCHES.....49-24

Price 50 cents

ANTHONY KOOHARIAN—Dec. 1952, pp. 317-328 (V. 49)

The voussoir arch is composed of many individual sections fitted one upon another to form an arch. The strength of these arches depends primarily on distribution of dead load and depth of the voussoirs.

Analysis and design problems associated with the voussoir arch are essentially the same as those of the unreinforced concrete arch. This structure may be analyzed by either the usual standard analysis or by limit analysis. This paper describes and studies both methods of analysis, with emphasis on the advantages of limit analysis to this type structure.

EFFECT OF CURRENT FREQUENCY ON MEASUREMENT OF ELECTRICAL RESISTANCE OF CEMENT PASTES.....49-25

Price 35 cents

J. CALLEJA—Dec. 1952, pp. 329-332 (V. 49)

This paper presents results obtained in a short study to determine the influence of frequency of the current employed for measuring electrical resistance of a cement paste, to establish the beginning and end of the setting period.

It was found that frequency of the current has no influence on the values found, although it is advisable to employ a frequency not smaller than 1000 cycles.

PROPOSED STANDARD SPECIFICATION FOR THE DESIGN AND CONSTRUCTION OF REINFORCED CONCRETE CHIMNEYS.....49-26

Price 75 cents

ACI COMMITTEE 505—Jan. 1953, pp. 353-400 (V. 49)

This revised specification sets forth recommended loadings, including provision for both wind and earthquake, for the design of reinforced concrete chimneys and recommended methods for determining the stresses in the concrete and reinforcement resulting from these loadings. The method of analysis includes determination of the stresses at horizontal cross sections where flue or other openings occur as well as at sections where the cross section is an annular ring. Charts containing curves to aid in the rapid solution of the specified formulas are included. While the method of analysis applies primarily to chimneys, it can be used for other hollow circular cross sections, with or without openings, where the shell thickness is small in proportion to the diameter.

Formulas are recommended for determining the temperature gradient through the concrete resulting from the difference in temperature of the gases inside the chimney and the surrounding atmosphere, together with methods for determining the stresses in the concrete and reinforcement both vertically and circumferentially due to the temperature gradient through the concrete.

Formulas for combining the stresses due to dead, wind, and earthquake loads with the stresses due to temperature are included in the specification, together with recommended allowable stresses in the concrete and reinforcement for the various stress combinations.

The specification covers the mixing and placing of the concrete by reference to the ACI "Building Code Requirements for Reinforced Concrete" (ACI 318—Latest Revision) with supplemental provisions to take care of the special requirements for concrete chimneys.

The specification also includes recommended practice for linings for concrete chimneys, where required, for lightning protection, access ladders, and other chimney accessories.

In an appendix many of the equations used are derived and the assumptions on which they are based are given.

PROGRESS REPORT IN PRESTRESSED CONCRETE.....49-27

Price 35 cents

MYLE J. HOLLEY, JR.—Jan. 1953, pp. 401-408 (V. 49)

Brief review of developments in linear prestressed concrete in the United States since the First U. S. Conference on Prestressed Concrete. Though European construction and achievements in prestressing continue to lead those in this country, there are now about 100 known projects in the United States incorporating linear prestressed concrete construction, either completed or under construction —about a ten-fold increase in one year. While foreign-developed prestressing systems have been widely used, there has also been widespread application of methods developed in this country.

PRESTRESSED CONCRETE IN TAMPA BAY BRIDGE.....49-28

Price 50 cents

W. E. DEAN—Jan. 1953, pp. 409-420 (V. 49)

The Lower Tampa Bay bridge in Florida is noteworthy in several respects. The 15-mile crossing will include approximately 3½ miles of concrete trestle constructed with precast and prestressed concrete beams. The bridge includes 363 prestressed concrete stringer spans, each 48 ft long. The reinforcement consists of high strength Lee-McCall bars, the first structure in this country to employ this prestressing system.

A test program on full size members was set up prior to beginning construction of the bridge. This also gave the contractor a chance to perfect construction procedures, which are outlined in the paper. Test results on a beam aided in establishing an empirical standard of quality to apply to the manufacture of units to be used on the job. A "composite beam" was tested to investigate the action of the composite T-section consisting of beam and deck slab.

DESIGN AND CONSTRUCTION OF A FULLY VIBRATION-CONTROLLED FORGING HAMMER FOUNDATION.....49-29

Price 50 cents

ALDEN M. KLEIN and J. H. A. CROCKETT—Jan. 1953, pp. 421-444 (V. 49)

The necessity of overcoming enormous ground vibrations due to forging operations and a desired lowering of production costs through lesser maintenance led to an entirely new design of a foundation for an 8-ton forging hammer.

This hammer is the first to be fully analyzed for shock, vibrations, movements and loads in all directions; the first to be built with prestressed concrete; the first to use high strength grouted concrete. The high strength and homogeneity requirements for the concrete and the extremely difficult placing conditions were met and overcome through the use of specially designed high strength grouted concrete.

WHAT DO WE NEED TO KNOW ABOUT PRESTRESSED CONCRETE?..49-30

Price 50 cents

N. M. NEWMARK—Jan. 1953, pp. 445-456 (V. 49)

A discussion of the more important points of uncertainty in our knowledge of prestressed concrete concerning which laboratory and field research is needed. There are many quantitative problems of detail which are not discussed, however, the major problems of principle are described.

The most important aspect of the problem is concerned with the basic philosophy of design. This involves selecting factors of safety or load factors, and must be solved before a consistent design procedure can be formulated.

PRESTRESSED CONCRETE GIRDERS SPAN COLLEGE HALL.....49-31

Price 50 cents

CURZON DOBELL—Jan. 1953, pp. 457-468 (V. 49)

The 65-ft prestressed concrete girders at Manhattanville College do not represent any spectacular advance in the use of prestressed concrete. They do, however, constitute the first major application of prestressing to building construction in this country and demonstrate a new system of tensioning and anchoring parallel wire cables with greater control and accuracy than was possible heretofore.

PRESTRESSED CONCRETE WINS PLACE IN MASSACHUSETTS BRIDGE PROGRAM.....49-32

Price 50 cents

J. C. RUNDLETT—Jan. 1953, pp. 469-484 (V. 49)

In constructing a 28-ft span prestressed concrete bridge, the Massachusetts Department of Public Works was able to evaluate the use of prestressing as well as gain experience for future construction. Design and construction problems are considered. Tests on full scale prestressed beams bore out the design criteria except that the loss in prestressing indicated that an allowance of 15 percent is insufficient.

LOOKING TO THE FUTURE IN PRESTRESSED CONCRETE CONSTRUCTION.....49-33

Price 35 cents

J. F. JELLEY—Jan. 1953, pp. 485-488 (V. 49)

Summarization of progress in prestressed concrete construction. Emphasis is placed on projects described in preceding papers and their part in pointing the way to future construction and greater use in America of this building technique.

CONSTRUCTION PROBLEMS OF PRESTRESSING.....49-34

Price 35 cents

MAXWELL UPSON—Jan. 1953, pp. 489-496 (V. 49)

Prestressing has offered a solution to the problem of getting the steel and concrete in reinforced concrete to act together more as a homogeneous whole than has heretofore been possible. Results of experiments with various types of prestressed piling have proved the applicability of this construction technique and illustrate the savings in materials that accrue from the use of prestressing. Use of prestressing in concrete sheet piling and hollow concrete piles is described.

CONSTRUCTION ASPECTS OF THIN-SHELL STRUCTURES.....49-35

Price 50 cents

ANTON TEDESKO—Feb. 1953, pp. 505-520 (V. 49)

Since material costs for thin-shell type structures represent a relatively lower percentage of total cost, form design, handling of formwork, and labor take on added importance. Construction techniques—form centering, concreting, decentering and movement of forms—are discussed. Costs and labor requirements for a typical project are given.

REINFORCED CONCRETE THIN-SHELL STRUCTURES.....49-36

Price 50 cents

CHARLES S. WHITNEY—Feb. 1953, pp. 521-536 (V. 49)

This paper supplements the report of the American Society of Civil Engineers' subcommittee on thin shells by illustrating more fully the possibilities of thin shell construction. Examples of completed and proposed structures are given and dimensional data are presented in tabular form. Roof structures consisting of thin membranes of reinforced concrete, curved in one or more directions, are of quite recent origin, but their development has been rapid and they offer important possibilities for economical construction where loads are principally distributed loads due to dead weight, wind and snow loading.

PRECAST CONCRETE OFFERS NEW POSSIBILITIES FOR DESIGN OF SHELL STRUCTURES.....49-37

Price 50 cents

PIER LUIGI NERVI—Feb. 1953, pp. 537-548 (V. 49)

Bold use of precast concrete in construction of various types of shell structures offers savings in material and formwork costs, as well as facilitating rapid construction. Outstanding examples of thin-shell construction, such as hangars, exhibition halls, and even naval vessels, are described. Special emphasis is placed on the use of precast elements in arched roofs, proving that precast and cast-in-place concrete can be used together, without losing the advantages of either. Details are given on the utilization of thin precast units in corrugated barrel vault structures.

DESIGN OF PRISMATIC SHELLS....49-38

Price 50 cents

HERMANN CRAEMER—Feb. 1953, pp. 549-564 (V. 49)

Differential equations for prismatic shells, based on the deflections of the edges, are derived and integrated for several single-span systems of various cross-sectional types. Depending on the cross section and the span, there is a gradual transition from a pure shell effect to that of a thin-walled beam.

PRECAST CONCRETE IN HIGHWAY BRIDGE CONSTRUCTION.....49-39

Price 35 cents

E. L. ERICKSON—Feb. 1953, pp. 565-572 (V. 49)

Precasting of reinforced concrete highway bridges has developed in some areas of the United States to a point where it has been demonstrated quite conclusively that the method has definite advantages in many instances over conventional cast-in-place construction and structural steel. Systems which have been used in the past and those which are in use today are described. References to specific jobs show the possibilities of precast bridge construction especially as applied to short span highway structures. Attention is called to the need for standardization so that bridge members of precast concrete can be manufactured in factories on a commercial basis if maximum economy is to be obtained.

ULTIMATE STRENGTH AND CRACKING RESISTANCE OF LIGHTLY REINFORCED BEAMS.....49-40

Price 50 cents

S. D. LASH—Feb. 1953, pp. 573-584 (V. 49)

The ultimate strength of beams reinforced with 1 percent or less of intermediate grade steel is somewhat greater than that indicated by either the plastic or conventional theories. This is because the theories neglect the effect of concrete in tension below the neutral axis. The excess is not great except for beams made with high strength concrete and small amounts of steel.

Cracking resistance of lightly reinforced beams depends upon the strength of the concrete and the amount of reinforcement. The tensile modulus of rupture of the concrete is increased significantly by the presence of reinforcement.

Deflection of a beam at yield of steel is independent of the amount of steel, provided the ratio of reinforcement is 0.7 percent or more. Below this limit the deflection diminishes and may be quite small.

BEHAVIOR OF COMPOSITE T-BEAMS WITH PRESTRESSED AND UNPRESTRESSED REINFORCEMENT..49-41

Price 35 cents

STEPHEN REVESZ—Feb. 1953, pp. 585-592 (V. 49)

Five different composite T-beams were tested to destruction to observe the behavior under loading. Reinforcement in four of the beams consisted of 0.105-in. diameter high tensile strength wire, tensioned to various stresses. For comparison, one beam was reinforced with mild steel. Deflections, strains and crack widths were measured and recorded.

Design and ultimate loads are examined in the light of estimated values based on simplified assumptions. Observations are drawn regarding warning of failure.

TEN-YEAR REPORT ON THE LONG-TIME STUDY OF CEMENT PERFORMANCE IN CONCRETE.....49-42

Price 50 cents

ADVISORY COMMITTEE, LONG-TIME STUDY—Mar. 1953, pp. 601-616 (V. 49)

Primarily, this study was undertaken to determine whether any relationship exists between the composition, fineness, and conditions of manufacture of the test cements and the ability of the concrete in which they were used to resist disintegration when subjected to external influences such as water, sulfate solutions, temperature changes, and highway traffic with or without application of salts for ice removal; and internal changes due to instability of the hardened cement paste.

Most of the test structures have now been exposed to weathering for ten years and this report presents the most important facts regarding the cements and their performance. Conclusions are presented concerning the lack of correlation between the behavior of concrete exposed to freezing and thawing and the chemical content or fineness of the cement; normal differences in manufacture do not significantly affect durability of concrete; and the increase of sulfate resistance with reduction of potential C_3A content of the cement. Substantiating other studies, the evidence was strong that air entrainment greatly increases the ability of concrete to endure freezing and thawing without deterioration and was found to be particularly effective in preventing scaling when chlorides are used for ice control on concrete pavements.

CONTINUOUS PRESTRESSED CONCRETE BEAMS.....49-43

Price 50 cents

FRITZ LEONHARDT—Mar. 1953, pp. 617-636 (V. 49)

One of the major problems in the design and construction of continuous prestressed concrete beams is the friction between the prestressing steel and the cable casing. Measures for reducing this friction are discussed and include the use of sliding provisions in the cable channels, concentrating the prestressing steel in a few cables, and arranging the cables in horizontal layers instead of a circular or ringlike arrangement. Instead of curving the prestressing elements continuously, a polygonal shape can be used, made up of long straight lines and short curved sections. Reducing friction without disturbing bond of the cables to the concrete can be accomplished by keeping the proper relationship between straight and curved portions. By the use of these measures, friction coefficients as low as 0.07 have been attained on a three-span girder.

YIELD-LINE THEORY FOR THE ULTIMATE FLEXURAL STRENGTH OF REINFORCED CONCRETE SLABS.....49-44

Price 50 cents

EIVIND HOGNESTAD—Mar. 1953, pp. 637-656 (V. 49)

An outline is presented of the yield-line theory, a plastic theory for the prediction of ultimate flexural strength of reinforced concrete slabs, developed by K. W. Johansen. The theory is based on plastic behavior occurring in a pattern of yield lines, the location of which depends on loading and boundary conditions. The ultimate flexural strength may be evaluated, even for complex slabs, with limited mathematical effort. The theoretical strengths obtained are in good agreement with experimental results, and generally on the safe side thereof. The use of the theory is illustrated by numerical examples.

SKEW SHELL UTILIZED IN UNUSUAL ROOF.....49-45

Price 35 cents

FELIX CANDELA—Mar. 1953, pp. 657-664 (V. 49)

Describes a shell arranged as a smooth conoidal double canopy, cantilevered 16 ft on both sides and supported on stone walls at the ends of its curved directrix. The general dimensions are 20 x 40 ft, with a thickness varying from 1 1/4 to 4 3/4 in.

Although the rigorous stress analysis of such a surface would be complicated, its relatively small size and curvature permits an approximate investigation which amounts to substitution of two straight lines converging at the arch apex for the curved directrix.

DIAGONAL TENSION IN T-BEAMS WITHOUT STIRRUPS.....49-46

Price 50 cents

PHIL M. FERGUSON and J. NEILS THOMPSON—Mar. 1953, pp. 665-676 (V. 49)

Tests on 24 T-beams without stirrups are reported. The chief variables are the effect of changing the concrete strength and the effect of extra web width over part of the beam depth. It is concluded that diagonal tension strength goes up very slowly as f_c' increases, that a unit shear working stress of $0.03f_c'$ is too high for beams of this type made of high strength concrete, and that extra web area is helpful even where it does not increase the minimum b' width.

The shear span-depth ratio is emphasized as a factor in planning or evaluating an investigation into diagonal tension strength.

FIRE RESISTANCE OF REINFORCED CONCRETE FLOORS.....49-47

Price 35 cents

J. P. THOMPSON—Mar. 1953, pp. 677-680 (V. 49)

A general discussion of the fire resistance of reinforced concrete floors—what has been done in the past, what is known at present, and what may be expected in the future. A recent test program by PCA is discussed. To obtain information on heat transmission through concrete floors and on the structural stability with usual amounts of protection for the reinforcement, the first tests were of solid one-way slabs of different thicknesses and different concretes.

THE SERVICES OF THE AMERICAN CONCRETE INSTITUTE...49-48

Price 35 cents

A. T. GOLDBECK—Apr. 1953, pp. 697-700 (V. 49)

Retiring ACI President Goldbeck discusses the early days of the Institute and the wide range of subjects covered by papers published in the *Proceedings* over the years. Standards and special publications are enumerated and the great amount of volunteer effort making them possible is noted. Conventions and regional meetings are seen as opportunities for personal contacts as well as sources of more formal information. Recent staff changes, membership trends, and prospects for the future are mentioned.

STRENGTH AND DURABILITY OF CONCRETE CONTAINING CHICAGO FLY ASH.....49-49

Price 50 cents

G. W. WASHA and N. H. WITHEY—Apr. 1953, pp. 701-712 (V. 49)

Results of laboratory tests indicate the strength that can be obtained when various amounts of Chicago fly ash are used in concrete mixes under various conditions. Results of a group of freezing and thawing tests show that air-entrained concretes made with and without Chicago fly ash are equally frost resistant. Chicago fly ash in concrete made with Type I portland cement increased resistance to attack by sulfuric acid. The tests were confined to fly ash from one electric utility company in Chicago and are not necessarily applicable to fly ashes from other sources.

PRODUCTION OF COMMERCIAL BLAST FURNACE SLAG.....49-50

Price 35 cents

FRED HUBBARD—Apr. 1953, pp. 713-720 (V. 49)

Discusses the types of blast furnace slag produced commercially; geographic availability; extent to which slag produced at blast furnaces is commercialized; usual chemical composition; and production procedures which differ from those of other aggregates.

RECENT CHANGES IN CORPS OF ENGINEERS CONCRETE CONSTRUCTION SPECIFICATIONS.....49-51

Price 35 cents

GEORGE L. OTTERSON and WOODROW L. BURGESS—Apr. 1953, pp. 721-728 (V. 49)

Describes Corps of Engineers documents which contain concrete construction policies of that organization. A recent change is the preparation of two guide specifications permitting the selection of provisions best adapted to the project and aimed at greater uniformity in small jobs.

Control measures for aggregate gradation, particle size, and uniformity are varied with the use of these materials in lean mass concrete or high-cement-factor concrete. Type II cement is generally specified although other types may be used where job conditions require them or costs permit their use.

Limits for air entrainment are raised to a range of 4 to 7 percent induced by the addition of air-entraining admixtures at the mixer. Water curing of concrete is the general practice with pigmented membrane curing compounds permitted where job conditions make water curing impractical.

Several classes of formed surfaces, depending on structural requirements, are specified and three types of control measures are provided for depending on the type of structure.

Conditions are also set down for mixing plant, reinforcing steel, water stops, and Prepakt concrete.

EFFECT OF STRAINING RATE ON THE COMPRESSIVE STRENGTH AND ELASTIC PROPERTIES OF CONCRETE.....49-52

Price 50 cents

D. WATSTEIN—Apr. 1953, pp. 729-744 (V. 49)

The effect of the rate of application of load was investigated using bonded wire strain gages in compressive tests of two concretes having approximate compressive strengths of 2500 and 6500 psi. The concrete was tested in the form of 3 x 6 in. cylinders at rates of straining ranging from 10^{-8} to about 10 in. per in. per sec, with the corresponding durations of test ranging from 30 min. to 0.0003 sec. The higher rates of straining were obtained by loading the concrete specimens in a drop-hammer machine. The rate of loading in the drop-hammer machine was controlled by placing rubber buffers of appropriate thickness and hardness on top of the concrete specimens.

The compressive strength of the concrete increased with the rate of loading. The maximum ratio of dynamic to static compressive strengths was about 1.8 for a rate of straining of 10 in. per in. per sec. The values of the secant moduli of elasticity increased significantly with the rate of application of load; the maximum ratio of dynamic to static modulus was 1.47 for the "weak" concrete and 1.33 for the "strong" concrete. Resistance of the concrete to impact as measured by its ability to absorb strain energy also increased with the rate of application of load.

PHYSICAL PROPERTIES OF HIGH-PRESSURE STEAM-CURED CONCRETE BLOCK.....49-53

Price 50 cents

ACI COMMITTEE 716—Apr. 1953, pp. 745-756 (V. 49)

Three methods for determining drying shrinkage of high-pressure steam-cured concrete block are described and results compared. A rapid method requiring only 24 hr immersion was found to be as practical as methods requiring 96 hr immersion for determining absorption and moisture losses. For measuring shrinkage, the rapid method is satisfactory provided allowance is made for the fact that the values determined are approximately twice those found in service.

A device for measuring tensile strength of concrete in whole block is described and illustrated. Although still under development test results were in good agreement.

THIN-SHELL PRECAST CONCRETE —AN ECONOMICAL FRAMING SYSTEM.....49-54

Price 35 cents

A. AMIRIKIAN—May 1953, pp. 773-780 (V. 49)

The framing arrangement generally referred to as "thin-shell precast concrete" has been the subject of many inquiries from engineers and builders. Some of the questions indicate that the system is not as yet fully understood or properly distinguished from conventional precast concrete. Others, who contemplate the utilization of this new method of construction, express some concern regarding certain phases of the novel technique. Still others want to know more about the actual applications and the experiences and opinions of the users. The following introductory notes, together with five papers arranged in the form of a symposium, are presented to furnish timely information on this type of construction.

THIN-SHELL RIB PANELS SITE FABRICATED IN PLASTIC MOLDS..49-55

Price 50 cents

M. R. MONTGOMERY and T. G. ATKINSON—May 1953, pp. 781-796 (V. 49)

Equipment, methods, and materials used in the field casting of thin-shell precast panels are described. The contractor's basic problem is outlined; experimental operations resulting in final method are touched briefly, together with fairly complete description of the methods used. While primarily concerned with casting of units, certain erection problems are so related with the casting that they are briefly brought in. The effect on casting economy is also very closely related to architectural and engineering design. Therefore, recommendations and conclusions are included which it is believed will increase the efficiency and economy of precast panel construction.

FACTORY PRODUCTION AND FIELD INSTALLATION OF THIN RIBBED PRECAST PANELS.....49-56

Price 50 cents

C. D. WAILES, JR.—May 1953, pp. 797-808 (V. 49)

Three hundred and fifty thousand square feet of precast panels, aggregating approximately 6700 tons, were factory produced, trucked 117 miles to job site, and erected to form the walls, floors, and roofs of various types of buildings. Eight basic panels, utilizing a 4-ft module, are adapted to barracks, mess halls, warehouses, and various other occupancies. Average weight of about 38 psf for the 24-ft span panels is a factor in making transportation and production at a factory economical.

FOUR MILLION SQUARE FEET OF THIN-SHELL RIB PANELS FOR ROOF FRAMING.....49-57

Price 50 cents

CHARLES C. ZOLLMAN—May 1953, pp. 809-824 (V. 49)

A detailed description of the required plant and the job planning for producing large numbers of identical precast concrete roof elements. These elements were used in 17 warehouses each 200 x 1000 ft. The initial contract required the production of 140 panels per day with a later additional contract calling for 132 panels per day.

Successive casting yard operations were release of side forms on previously cast panels; stripping and storing panels, cleaning molds, placing preassembled reinforcing cages; placing approximately 95 cu yd of concrete; vibrating, screeding, vacuum processing, and finishing of the concrete; curing; removal of spilled concrete; and washing and cleaning of vacuum mats and other equipment.

So effective was the prior planning and the setting up and operation of the casting yard that the only important interruptions to production were when the construction of cast-in-place rigid frames could not keep up to the supply of panels.

FABRICATION AND ERECTION OF PRECAST ENCLOSURE FRAMING FOR ONE-STORY BARRACKS.....49-58

Price 35 cents

FORD J. TWAITS and MARTIN M. DENN—May 1953, pp. 825-832 (V. 49)

The construction of precast concrete barracks buildings for the United States Marine Corps artillery training facility on the desert near Twentynine Palms, Calif., is described. Thin-shell ribbed roof panels are manufactured in a central casting yard and wall panels are cast on the building floors. The wall panels are erected and plywood lined steel forms for cast-in-place rigid frames are attached. Roof panels are transported from the casting yard, set in position on the steel forms and the rigid frames are concreted.

CAREFUL PLANNING A NECESSITY IN BUILDING WITH PRECAST CONCRETE.....49-59

Price 35 cents

BENTON H. PROCK—May 1953, pp. 833-840 (V. 49)

Any project involving large quantities of precast concrete elements must take into account planning, organization equipment, and erection—all interrelated and dependent on each other for successful completion of the job. The most important phase of the whole operation is planning. Good engineering forethought that determines casting yard layout, sequence of operations, precasting and erection techniques, selection of equipment, and manpower organization prior to actual construction will lead to decreased operating costs.

CHEMICAL REACTIONS IN HIGH-PRESSURE STEAM CURING OF PORTLAND CEMENT PRODUCTS...49-60

Price 50 cents

W. C. HANSEN—May 1953, pp. 841-856 (V. 49)

A review of the literature on the chemical reactions in cement-silica pastes indicating the changes which may occur during the curing of portland cement concrete products at ordinary temperatures and at the elevated temperatures in steam curing. A bibliography lists the works reviewed.

PROPOSED MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE HIGHWAY STRUCTURES.....49-61

Price 35 cents

ACI COMMITTEE 315—May 1953, pp. 857-860 (V. 49)

It is the purpose of the manual to present recommended methods of preparing drawings for the fabrication and placing of reinforcing steel in reinforced concrete highway structures. Typical drawings illustrate the use of the standard methods.

COMPACTING CONCRETE BY VIBRATION.....49-62

Price 35 cents

H. S. MEISSNER—June 1953, pp. 885-892 (V. 49)

Vibration compaction is one of the important advancements in concrete technology. There yet remains, however, something to be learned about the fundamentals of vibration and the characteristics of vibrators to make more efficient use of this method for compacting concrete. A description and classification is given of the various vibrators in use together with some discussion of their characteristics and the type of work for which they are adapted.

LABORATORY TESTS ON VIBRATION OF CONCRETE.....49-63

Price 50 cents

SVEN G. BERGSTROM—June 1953, pp. 893-908 (V. 49)

A brief survey of tests dealing with pressures, displacements, and energy consumption in fresh concrete compacted by internal vibration. Three methods of determining the radius of action of the internal vibrator and the effects of variation in the radius of action with the concrete mix and with the vibrator characteristics are discussed. A graph presents some data on the energy consumption during vibration. Described is an apparatus for studying variations in the properties of fresh concrete with time of vibration. The type of these variations characterizes the fresh concrete in respect to required time of vibration and liability to segregation. Mention is made of a few test results concerning the relation between properties of hardened concrete and time of vibration.

EFFECT OF VIBRATION ON AIR CONTENT OF MASS CONCRETE...49-64

Price 50 cents

WALTER O. CRAWLEY—June 1953, pp. 909-920 (V. 49)

Tests were made to observe the effect of high-frequency (13,000 vpm) and moderate-frequency (6800 vpm) vibration on concrete ranging from ½- to 4-in. slump, containing 6-in. coarse aggregate, and having nominal air contents of 3, 6, and 9 percent in that portion of the mix smaller than the 1½-in. sieve. Cores drilled from hardened specimens of the concrete with 6 percent air content were examined micrometrically for amount and distribution of air and coarse aggregate.

The high-frequency vibrator was found to cause more rapid loss of entrained air than the moderate-frequency vibrator. However, either vibrator could cause a 50 percent loss in air from nominal 3 percent-air-content concrete in 30 sec. The rate at which air was lost generally increased with slump, but not to a marked degree. The high-frequency vibrator had more effect in causing movement and escape of air, while the moderate-frequency vibrator caused more movement and segregation of the coarse aggregate.

VIBRATION OF MASS CONCRETE.49-65

Price 50 cents

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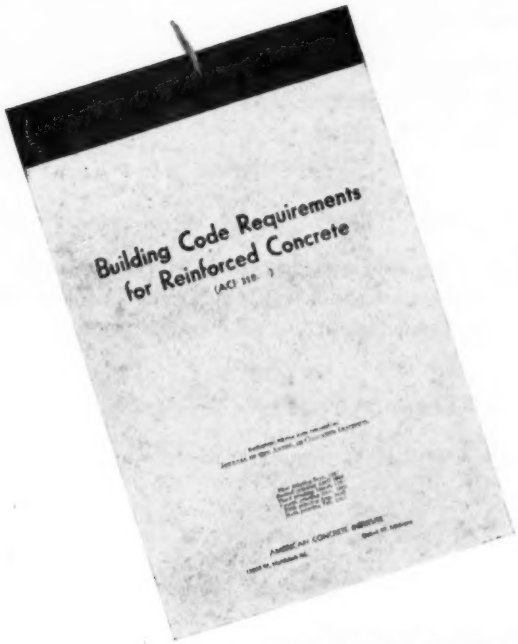

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